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SUGAR BULLETIN No. 2.

FIELD EXPERIMENTS WITH SUGAR CANE, II.

BY

C. HOLMAN B. WILLIAMS,

Sugar Cane Agronomist,

AND

R. R. FOLLETT-SMITH,

Chemist-Ecologist.

THE DAILY CHRONICLE," GEORGETOWN, DEMERARA,
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Note :—The cost of publishing this Bulletin has been met from the funds of the Sugar Experiment Stations' Committee.

LIST OF STAFF

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F. Burnett, M.C., M.A., ...	Deputy Director of Agriculture

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E. M. Morgan,[1]	„ Instructor.
H. B. France,[1]	„ Assistant.

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1 In connection with the experiments at Blairmont and Port Mourant.

2 In connection with experiments at Leonora.

TABLE OF CONTENTS.

	PAGE
PREFACE—	i
INTRODUCTION	1
VARIETY TRIALS—	1
Sophia Experiment Station...	1
Pln. Lusignan...	11
„ Port Mourant	14
Summary	17
MANURIAL TRIALS—	20
Experiments with Graded Dressings of Nitrogenous Manures	20
Experiments with Lime-bearing Materials	37
Experiments with Phosphatic Manures	42
Experiments with Potassic Manures	42
Discusssion	45
Summary	47
APPENDIX I—	49
Calendar of Agricultural Operations on Manurial Trial Sites	49
APPENDIX II—	50
Soils of Manurial Trial Sites	50

PREFACE.

This second Bulletin of the sugar series, recently inaugurated by the Department, presents the results from six variety and seven manurial trials reaped during the first half of 1933. It is not as comprehensive as *Sugar Bulletin* No. 1, but contains a great deal of valuable information which it was felt should be placed at the disposal of the industry with as little delay as possible, the more so as it is not intended to publish other numbers until the results of another full year's work have been obtained.

It is unfortunate that no Diamond 10, one of the promising varieties recommended for extension as a result of its performance in the tests previously reported, was included in any of the trials here discussed, but limitations of space and planting material preclude any one variety from appearing in all the trials. D. 625, moreover, still remains the standard cane.

As a plant cane, D. 241/21 has given a remarkable yield at Port Mourant, Berbice, and this variety will receive the further attention it merits. The ratoon results obtained from P. O. J. 2878 and D. 207/20 confirm the promise these varieties gave as plants.

The measurement of the sucrose quality of the cane from each plot of the manurial trials has been continued. Since the appearance of the first Bulletin, the necessity for these analyses has been stressed in two articles appearing in the *International Sugar Journal*.

The majority of the trials experienced ill-distributed rainfall which doubtless tended to reduce the effects of the heavier nitrogenous applications.

Experimental results indicate that inorganic nitrogenous manures are cheaper and no less effective than organic nitrogenous manures, when considered over one or two crops. The very debatable question regarding the alternative use of organic and inorganic nitrogen cannot, however, be hastily decided.

This Bulletin contains striking evidence of the differential response of varieties to applications of sulphate of ammonia. From the experiments reported on pages 29-34 it appears that Diamond 10 can utilise efficiently more nitrogen than the seedling D. 602/22.

It is realised that the phosphate question requires re-investigation, and it is hoped that arrangements for the establishment of a chain of experiments in this connection will shortly be concluded.

Bulletin No. 2 contains information of considerable importance to everyone connected with the Colony's major industry.

J. SYDNEY DASH,
Director of Agriculture.

FIELD EXPERIMENTS WITH SUGAR CANE, II.

BY

C. HOLMAN B. WILLIAMS,
Cane Agronomist,

AND

R. R. FOLLETT-SMITH,
Chemist Ecologist,

INTRODUCTION.

This Bulletin records the results obtained from field experiments with sugar cane reaped during the half-year ending June 30, 1933. The Bulletin is divided into two sections, *viz.* :—

"VARIETY TRIALS", dealing with six experiments, and
"MANURIAL TRIALS", dealing with seven experiments.

The general conditions under which the experiments were executed were similar to those described in the Introduction to *Sugar Bulletin* No. 1.

VARIETY TRIALS.

SOPHIA EXPERIMENT STATION.

The following trials have been reaped :—

TABLE I.—VARIETY TRIALS REAPED AT SOPHIA EXPERIMENT STATION.

Field.	Age of Cycle.	Age of Canes, Months.	Date of		Number of		Type of Layout.
			Planting or Previous Reaping.	Reaping.	Treatments.	Replicates.	
3 E.	Plants	16.00	7. XI. 31	6. III. 33	6	6	Latin Square
8 E.	1st Ratoons	11.25	19. V. 32	24. IV. 33	10	7	Randomised Blocks
9 E.	„ „	11.50	12. V. 32	26. IV. 33	10	7	„ „
10 E.	„ „	12.00	4. III. 32	2. III. 33	10	5	„ „

Table II gives the monthly rainfall recorded during the progress of the experiments and the mean monthly rainfall at Sophia, as determined from the 12-year period, 1921-1932.

TABLE II.—RAINFALL AT SOPHIA EXPERIMENT STATION.

MONTH.	FIELD 3 E.		FIELDS 8 & 9 E.		FIELD 10 E.	
	Actual Fall, 1931-1933, Inches.	Average Fall, 1921-1932, Inches.	Actual Fall, 1932-1933, Inches.	Average Fall, 1921-1932, Inches.	Actual Fall, 1932-1933, Inches.	Average Fall, 1921-1932, Inches.
November, 1931	1.87	5.73	...	...	...	...
December	8.99	14.43	...	...	...	...
January, 1932	8.92	7.26	...	...	...	...
February	1.12	3.53	...	...	...	...
March	6.57	3.97	...	...	6.57	3.97
April	15.31	5.05	...	...	15.31	5.05
May	13.33	11.81	...	...	13.33	11.81
June	14.94	14.67	14.94	14.67	14.94	14.67
July	7.10	10.80	7.10	10.80	7.10	10.80
August	6.84	8.23	6.84	8.23	6.84	8.23
September	.45	2.85	.45	2.85	.45	2.85
October	3.89	3.92	3.89	3.92	3.89	3.92
November	.09	5.73	.09	5.73	.09	5.73
December	16.40	14.43	16.40	14.43	16.40	14.43
January, 1933	7.56	7.26	7.56	7.26	7.56	7.26
February	4.77	3.53	4.77	3.53	4.77	3.53
March	...	...	5.43	3.97	...	...
April	...	...	5.36	5.05	...	...
Total	118.15	123.20	72.83	80.44	97.25	92.25

Field 3 E. was rather short of rain in November 1931 and February, September and November 1932, but the fall was satisfactory during the remainder of the growth period, April 1932 being unusually wet. The total fall was 5 inches below what might have been expected.

Fields 8 and 9 E. received 8 inches less rainfall than the normal, September and November 1932, being the abnormally dry months.

Field 10 E. had a total rainfall 5 inches above the normal, April 1932 being an unusually heavy month. However, the canes suffered for lack of water in September and November 1932.

Composite soil samples from the experimental areas have yielded the following results in the Laboratory :

TABLE III.—SOILS OF VARIETY TRIAL SITES AT SOPHIA.

	FIELD 3 E.		FIELD 8 E.		FIELD 9 E.		FIELD 10 E.	
	0-12 Inches.	12-24 Inches.	0-12 Inches.	12-24 Inches.	0-12 Inches.	12-24 Inches.	0-12 Inches.	12-24 Inches.
Normal pH ...	5.70	5.92	5.54	7.17	5.25	6.53	5.82	7.16
Exchange pH ...	4.48	4.92	4.29	5.86	4.29	5.45	4.81	5.96
M.P.S.	46.4	45.5	50.2	49.2	52.8	54.6	46.2	48.3
% Sand	4.0	2.2	6.0	4.6	2.7	2.1	4.4	3.8
Index of Texture ...	46	45	49	48	52	54	45	48
% Soluble Salts ...	0.078	0.238	0.073	0.184	0.044	0.207	0.081	0.268
% Organic Matter ...	1.50	0.94	1.86	0.57	1.85	0.78	1.86	0.76
% Nitrogen ...	0.122	0.090	0.126	0.077	.150	.082	0.140	0.078
Carbon ; Nitrogen Ratio	7.13	6.08	8.57	4.35	7.17	5.50	7.72	5.76
Rate of Solution ...	15	23	24	26	139	26	38	4
Lime Reqt., Tons per acre $CaCO_3$ ..	3.5	2.6	4.0	1.7	4.2	1.2	2.8	1.0

The topsoil of Field 3 E. is a markedly acidic clay overlying a markedly acidic heavy silt. The organic matter contents of the topsoil and subsoil are low. The carbon : nitrogen ratio in the topsoil is normal, that in the subsoil is wider than the average. The salinity is much above the normal. The theoretical lime requirements are low.

In Field 8 E. the topsoil is a markedly acidic clay overlying a slightly acidic clay subsoil. The organic matter content of the topsoil is normal, that of the subsoil is below the average. The carbon : nitrogen ratio of the topsoil is wider than the normal, that of the subsoil is narrower than the average. The salinity of the topsoil exceeds expectation, that of the subsoil is normal. The theoretical lime requirement of the topsoil is below the average, that of the subsoil is normal.

The topsoil of Field 9 E. is a markedly acidic clay overlying a slightly acid clay subsoil. Both soil and subsoil contain an average amount of organic matter with a normal carbon : nitrogen ratio. The soluble salt content of the topsoil is below the average, that of the subsoil is normal. The theoretical lime requirements of both topsoil and subsoil are lower than the average.

In Field 10 E. the topsoil is a markedly acidic heavy silt overlying a slightly acidic clay subsoil. The organic matter content of the topsoil exceeds expectation, that of the subsoil is normal. The carbon : nitrogen ratio in the topsoil is wider than the average, that of the subsoil is normal. The theoretical lime requirements of the topsoil and subsoil are low.

The Results.

In Field 3 E., D. 53/27 and D. 625 were compared at different row spacings, *viz.*:—3 ft., 4.5 ft., and 6 ft. Statistical analysis of the results indicates that the varying spacings had no significant effect on the yield and the results from all spacings are therefore grouped in Table IV, below.

Table IV.—Results of Variety Trial in Field 3 E., Sophia.

Estate :	Sophia.						
Field :	3 East.						
Age of Cycle :	Plants.						
Age of Canes :	16 Months.						
	Variety.	Cane per Acre, Tons.	Sucrose in Cane, %.	Glucose Ratio.	Purity.	Sucrose in Cane per Acre, Tons.	Sucrose in Cane per Acre, % Mean.
Mean Yields:	D. 53/27	43.82	11.77	8.95	85.1	5.21	113.26
	D. 625	33.65	12.00	11.95	83.9	4.00	86.96
	Mean:					4.60	100.00
	Standard Error:					0.19	4.13
	Significant Difference, 20 : 1 :					.51	11.09

It will be seen that D. 53/27 proved to be definitely better than D. 625 under the conditions of this experiment. In another plant cane trial at Sophia (already reported) it also gave a good account of itself and led D. 625 by a wide margin. At Non Pareil, however, it came last of 11 varieties as a plant cane and the plots failed completely to ratoon. This is a vigorous growing cane which attracts attention as a 'plant', but experience on the Station and reports from several estates point to its having very poor ratooning qualities. It cannot, in consequence, be recommended, and will be dropped from the trials. Despite the age of the crop, D. 625 had not ripened, and its juice had a high glucose ratio. Figure I shows graphically the results obtained from this trial.

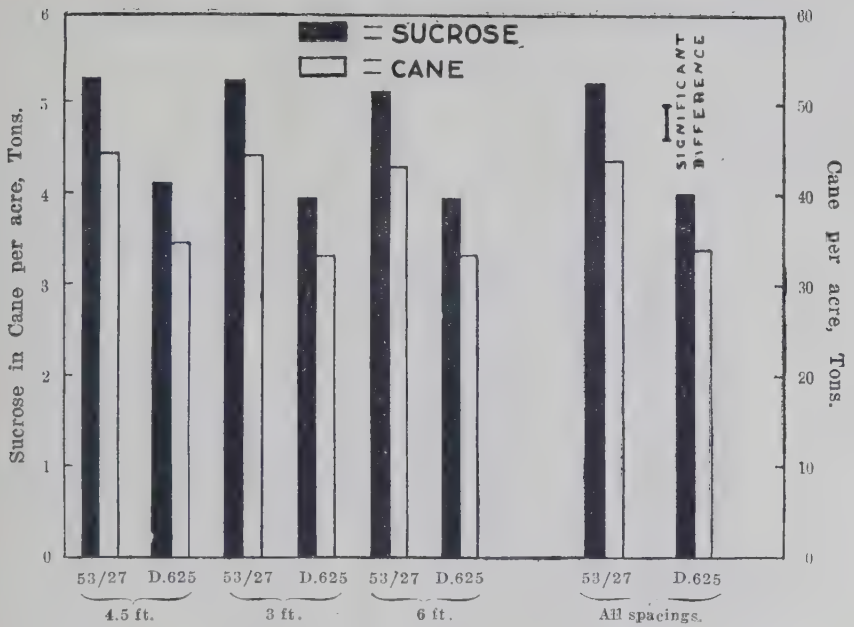

FIG. I.

Yields of Sucrose and Cane, per Acre, from Field 3E., Sophia (Plant Canes).

Field 8 E., from which plant cane results have already been reported, (*Sugar Bulletin* 1, pp. 6, 11 & 12) was reaped as a first ratoon. The results are given in Table V, and the total yield for both crops graphically depicted in Figure II.

TABLE V.—RESULTS OF VARIETY TRIAL IN FIELD 8 E., SOPHIA.

Estate : Sophia.

Field : 8 East.

Age of Cycle : 1st Ratoons.

Age of Canes : 11.25 Months.

	Variety.	Cane per Acre, Tons.	Sucrose in Cane, %.	Glucose Ratio.	Purity.	Sucrose in Cane per Acre, Tons.	Sucrose in Cane per Acre, % Mean.	Combined Results Plants and 1st Ratoons. Variety.	Sucrose in Cane per Acre, Tons.
Mean. Yields:	D. 351/20	21.77	13.86	15.44	88.1	3.02	116.60	D. 351/20	8.14
	D. 625	21.46	14.02	9.97	86.9	3.02	116.60	D. 625	7.55
	D. 424/21	20.38	14.27	10.54	86.3	2.90	111.97	D. 1034/21	7.19
	D. 1034/21	20.80	13.77	16.42	86.3	2.86	110.42	D. 1034/22	7.10
	D. 1034/22	20.21	13.38	12.06	86.3	2.70	104.25	D. 204/20	6.84
	D. 238/17	19.10	13.49	9.25	87.2	2.58	99.61	D. 424/21	6.65
	D. 789/18	16.94	13.37	15.20	85.9	2.27	87.64	D. 376/17	6.58
	D. 376/17	16.78	13.47	14.93	86.6	2.27	87.64	D. 238/17	6.47
	D. 75/20	16.73	13.24	14.13	85.2	2.24	85.71	D. 789/18	6. 8
	D. 204/20	16.09	13.05	11.96	84.8	2.10	81.08	D. 75/20	5.96
	Mean:					2.59	100.00		
	Standard Error:					0.11	4.25		
	Signficant Difference, 20: 1:					0.34	13.13		

D. 351/20 tied which D. 625 for first place in the first ratoons. In the plant canes it had been significantly better, consequently, when both crops are considered, it leads D. 625 by .59 ton sucrose per acre. Both as plants and as first ratoons the juice purity of D. 351/20 was higher than that of D. 625. On a somewhat similar type of soil at Pln. Lusignan this seedling has proved significantly better than D. 625 both as a plant cane and as a first ratoon. On the other hand, in two other trials at Sophia and one at Pln. Diamond it has given disappointing results. It will be given another trial. No other variety calls for special mention. The field had to be reaped rather early and this had an adverse effect on the glucose ratios which are in general, unsatisfactorily high.

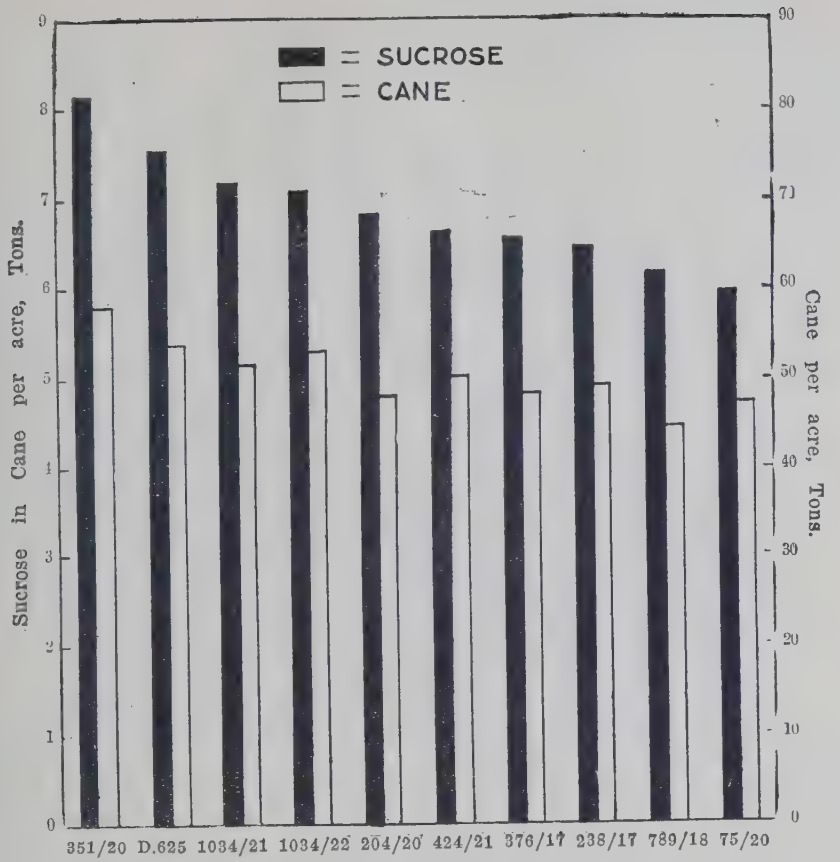

FIG. II.

Total Yields of Sucrose and Cane, per Acre, from Field 8E., Sophia (Plant Canes and First Ratoons).

The plant cane results from Field 9 E. have already been given (*Sugar Bulletin* 1, pp. 6, 9 & 13). The first ratoon data are shown in Table VI and the combined results of both crops in Figure III.

TABLE VI.—RESULTS OF VARIETY TRIAL IN FIELD 9 E., SOPHIA.

Estate : Sophia.

Field : 9 East.

Age of Cycle : 1st Ratoons.

Age of Canes : 11.5 Months.

	Variety.	Cane per Acre, Tons.	Sucrose in Cane, %.	Glucose Ratio.	Purity.	Sucrose in Cane per Acre, Tons.	Sucrose in Cane per Acre, % Mean.	Combined Results Plants and 1st Ratoons. Variety.	Combined Results Plants and 1st Ratoons. Sucrose in Cane per Acre, Tons.
Mean Yields :	P.O.J. 2878	20.98	14.30	8.19	86.8	3.01	120.88	P.O.J. 2878	7.89
	D. 557/20	20.92	14.23	10.50	86.9	2.98	119.68	D. 573/22	7.65
	D. 625	19.27	13.98	9.94	86.0	2.69	108.03	D. 625	7.49
	D. 893/21	20.21	13.08	10.34	85.2	2.66	106.83	D. 557/20	7.25
	D. 663/13	19.15	13.87	13.34	86.9	2.66	106.83	D. 744/21	7.16
	D. 573/22	17.44	14.39	7.90	87.7	2.50	100.40	D. 893/21	6.64
	D. 383/22	18.52	13.49	15.24	86.9	2.49	100.00	D. 383/22	6.54
	D. 744/21	16.84	14.50	12.95	87.3	2.43	97.59	D. 663/13	6.42
	D. 571/20	12.17	14.22	10.25	86.9	1.73	69.48	D. 699/20	5.81
	D. 699/20	11.35	15.25	7.21	88.8	1.72	69.08	D. 571/20	5.67
	Mean :					2.49	100.00		
	Standard Error :					0.15	6.02		
	Significant Difference, 20 : 1 :					0.45	18.06		

P.O.J. 2878, which led D. 625 by a small margin of 2 per cent in the plant canes, led it by more than 12 per cent in the first ratoons, its total yield for the two crops being .40 ton sucrose per acre more than that of D. 625. This is the first local test in which P.O.J. 2878 has been reaped as a ratoon and it is pleasing to note that its sucrose content and purity were both higher than the corresponding figures for D. 625, although, through unavoidable circumstances, it was necessary to reap the field at 11.5 months. D. 573/22 dropped from first place in the plants to sixth in the first ratoons. Taking the two crops into consideration, however, it appears to lead D. 625 by a small margin. This field too was reaped somewhat early and the glucose ratios of most of the varieties indicated immaturity.

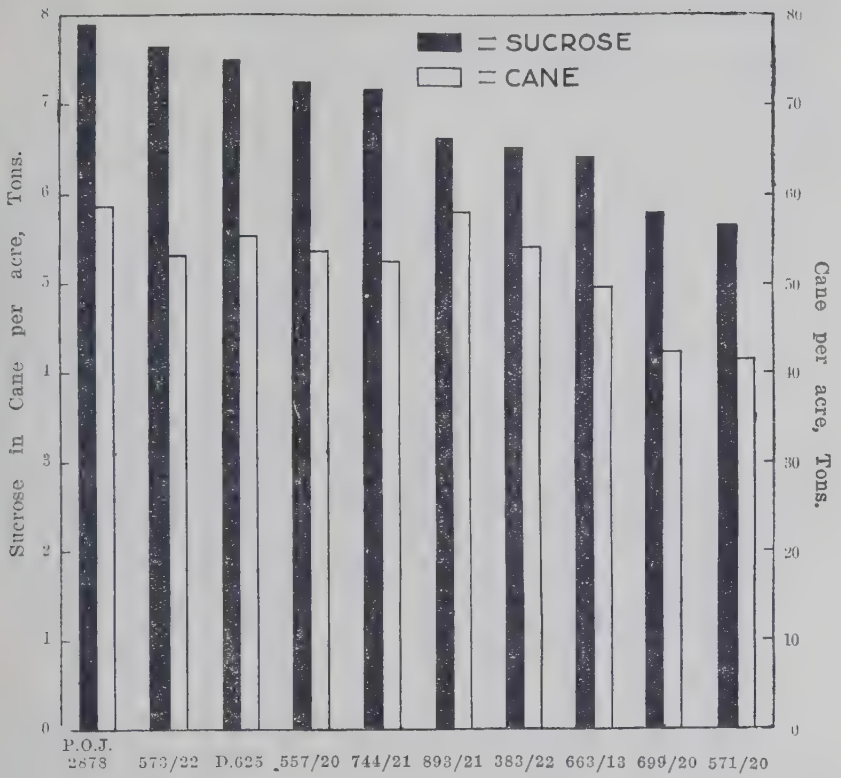

FIG. III.

Total Yields of Sucrose and Cane, per Acre, from Field 9E., Sophia (Plant Canes and First Ratoons).

Table VII. and Figure IV show the results obtained from Field 10 E.

TABLE VII.—RESULTS OF VARIETY TRIAL IN FIELD 10 E., SOPHIA.

Estate:				Sophia.						
Field:				10 East.						
Age of Cycle:				1st Ratoons.						
Age of Canes.:				12.0 Months.						
	Variety.	Cane per Acre, Tons.	Sucrose in Cane, %.	Glucose Ratio.	Purity.	Sucrose in Cane per Acre, Tons.	Sucrose in Cane per Acre. % Mean.	Combined Results Plants and 1st Rations. Variety.	Sucrose in Cane per Acre, Tons.
Mean Yields:	D. 207/20	26.13	12.97	5.56	87.4	3.39	115.70	D. 207/30	8.08
	D. 203/20	25.96	12.73	6.46	87.6	3.29	112.29	D. 203/20	7.75
	D. 625	23.73	13.44	8.16	85.7	3.18	108.53	D. 625	7.63
	D. 927/22	24.87	12.30	5.47	86.6	3.06	104.44	D. 895/22	7.51
	D. 895/22	22.77	13.17	5.17	86.8	3.00	102.39	D. 927/22	7.31
	D. 1175/22	23.67	12.38	6.73	84.6	2.93	100.00	D. 602/22	7.25
	D. 73/20	21.70	13.40	4.68	88.8	2.91	99.32	D. 73/20	6.62
	D. 602/22	20.65	13.29	5.03	87.9	2.76	94. 0	D. 6/21	6.60
	D. 6/21	23.84	11.43	12.23	80.6	2.74	93.51	D. 1175/22	6.56
	D. 918/22	17.30	11.82	10.27	83.3	2.03	69.28	D. 918/22	4.93
	Mean:					2.93	100.00		
	Standard Error:					.19	6.48		
	Significant Difference, 20:1:					.61	20.82		

D. 207/20, which was first in the plant canes, maintained that place in the first ratoons, and led D. 625, in the total yield for both crops, by a margin of .45 ton sucrose. D. 203/20, which was above D. 625 in the plant canes, retained its position in the ratoons and led it by a small margin for the two crops. D. 895/22 and D. 927/22 seem worthy of further trial.

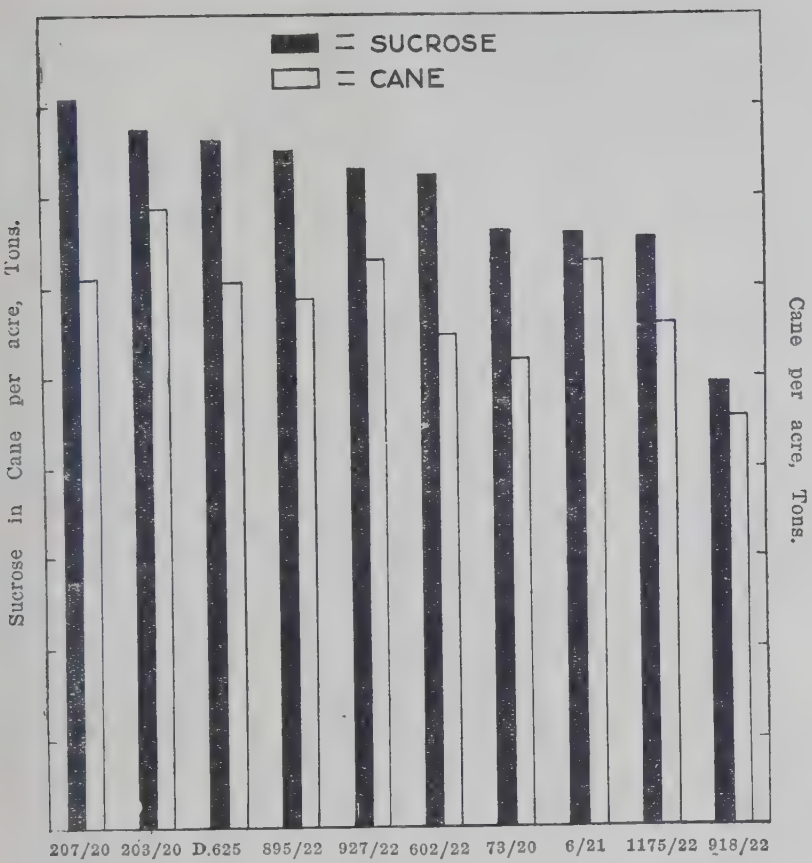

FIG. IV.

Total Yields of Cane and Sucrose, per acre from Field 10E., Sophia (Plant Canes and First Ratoons).

PLANTATION LUSIGNAN.

One plant cane trial was reaped, in Field 38 Annandale, at the age of 13.75 months. There were 10 varieties in seven randomised blocks, the field having been planted on February 27, 1932, and reaped on April 19, 1933.

The rainfall for the experimental period and the monthly averages are compared below :

TABLE VIII.—RAINFALL AT PLANTATION LUSIGNAN.

Month.	Rainfall.	
	1932-1933, Inches.	1910-1932, Inches.
March, 1932	5.12	4.57
April	16.15	5.54
May	12.51	11.18
June	13.06	12.33
July	5.81	9.67
August	6.27	5.93
September	0.11	2.16
October	1.98	2.92
November	0.54	4.61
December	15.26	10.40
January, 1933	7.20	8.18
February	4.30	4.10
March	6.08	4.57
April	8.41	5.54
TOTAL ...	102.80	91.70

It will be seen that the total rainfall received was well above the average (mainly as a result of the high fall in April 1932), but that the canes passed through a droughty period in September – November, 1932.

Composite soil samples from the experimental area have yielded the following results in the Laboratory :

TABLE IX.—SOIL OF VARIETY TRIAL SITE AT PLN. LUSIGNAN.

	Field Annandale 38.	
	0—12 Inches.	12—24 Inches
Normal pH	4.80	4.65
Exchange pH	3.83	3.85
M.P.S.	42.6	42.5
% Sand	4.5	7.0
Index of Texture ...	42	41
% Soluble Salts	0.061	0.174
% Organic Matter ...	2.02	0.96
% Nitrogen	0.131	0.085
Carbon : nitrogen Ratio ...	8.94	6.53
Rate of Solution... ...	—81	38
Lime Requirement, Tons/acre $CaCO_3$	9.4	5.6

The topsoil is a markedly acidic heavy silt overlying a subsoil similar in texture and reaction. The organic matter content of the topsoil is normal, that of the subsoil is below the average. The carbon : nitrogen ratio in the topsoil is wider than is usual, that in the subsoil is of an average value. The salinity of both topsoil and subsoil is much above the average. The theoretical lime requirement of the topsoil is normal, that of the subsoil is below the normal.

The results of this trial are presented in Table X and Figure V.

TABLE X.—RESULTS OF VARIETY TRIAL IN FIELD 38 A., LUSIGNAN.

Estate :				Lusignan.			
Field :				38 Annandale.			
Age of Cycle :				Plants.			
Age of Canes :				13.75 Months.			
	Variety.	Cane per Acre, Tons.	Sucrose in Cane, %	Glucose Ratio.	Purity.	Sucrose in Cane, per Acre, Tons.	Sucrose in Cane, per Acre, % Mean.
Mean Yields :	D. 628/21	35.00	12.90	10.69	84.2	4.51	113.60
	D. 625	34.32	12.59	12.18	84.9	4.32	108.82
	D. 602/22	31.44	12.81	11.60	85.0	4.04	101.76
	D. 573/22	29.71	13.43	7.57	86.5	4.00	100.76
	D. 163/21	38.10	10.23	19.74	79.5	3.91	98.49
	D. 92/21	29.75	13.14	12.49	85.6	3.91	98.49
	D. 663/13	29.59	13.05	10.17	86.4	3.86	97.23
	D. 835/18	32.20	11.66	14.21	82.9	3.76	94.71
	D. 648/22	31.11	12.05	11.23	85.6	3.76	94.71
	D. 695/13	28.73	12.51	11.54	85.7	3.60	90.68
	Mean :					3.97	100.00

Apparently the varieties tried in this experiment were very similar in yielding capacity under the conditions prevailing, for, there was only a difference of 23 per cent between the lowest and the highest yielder. As a consequence the experiment, as a whole, did not satisfy the "Z" test for significance, and no conclusions can be drawn. Glucose ratios indicate that the canes were somewhat immature at the time of reaping.

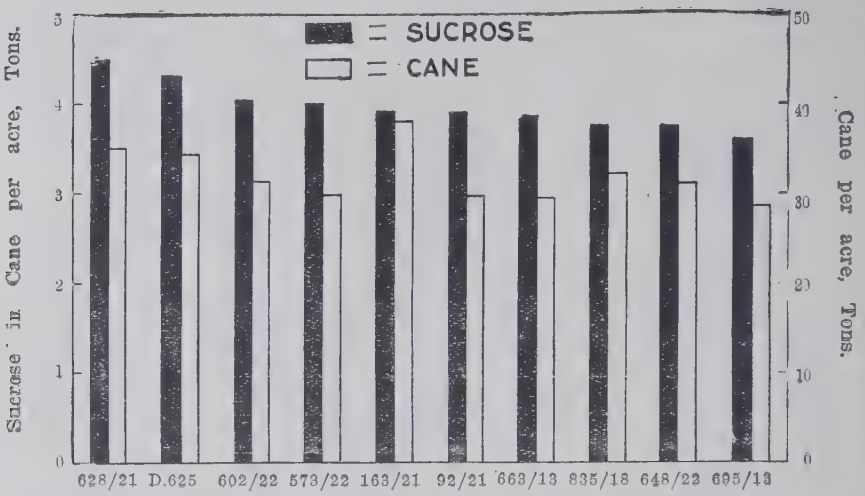

FIG. V.

Yields of Sucrose and Cane, per Acre, from Field 38A., Lusignan (Plant Canes).

PLANTATION PORT MOURANT.

Field Ankerville Old Land 14, was planted on April 7, 1932, and reaped, at 12.25 months, on April 14, 1933. The experiment consisted of 9 varieties arranged in 7 randomised blocks.

The rainfall experienced by this experiment and the monthly averages for the Estate are campared Table XI.

TABLE XI.—RAINFALL AT PLANTATION PORT MOURANT.

Month.	Rainfall.	
	1932-1933, Inches.	1911-1932, Inches.
April, 1932	14.46	4.83
May	5.73	8.75
June	13.74	9.42
July	6.93	8.83
August	7.69	4.83
September	2.73	2.02
October	1.78	2.52
November	.26	3.26
December	9.15	8.01
January, 1933	6.01	6.95
February	4.32	4.67
March	5.80	3.52
TOTAL ...	78.60	67.61

It will be seen that the experiment was well watered, the total fall exceeding expectations by 11 inches. Only in November 1932 was their any marked drop below the average.

Composite soil samples from the experimental area have yielded the following results in the Laboratory:

TABLE XII.—SOIL OF VARIETY TRIAL SITE AT PLN. PORT MOURANT.

	Field Ankerville O.L. 14.	
	0—12 Inches.	12—24 Inches.
Normal pH	5.87	5.83
Exchange pH	4.69	4.81
M.P.S.	42.1	43.6
% Sand	3.0	2.4
Index of Texture	41	43
% Soluble Salts	.041	.114
% Organic Matter	1.88	1.38
% Nitrogen	.152	.109
Carbon : nitrogen Ratio ...	7.17	7.37
Rate of Solution	173	55
Lime Requirement, Tons/acre $CaCO_3$	4.1	3.1

The topsoil is a markedly acidic heavy silt overlying a markedly acidic heavy silt subsoil. The organic matter content of the topsoil is below the average, that of the subsoil is normal. The carbon-nitrogen ratios in the topsoil and subsoil are below the average. The theoretical lime requirement of the topsoil is below the normal, that of the subsoil is of an average value.

The results of this trial are given in Table XIII and Figure VI.

TABLE XIII.—RESULTS OF A VARIETY TRIAL IN FIELD 14 A., O.L., PORT MOURANT.

Estate :	Port Mourant.
Field :	14 Ankerville O.L.
Age of Cycle :	Plants.
Age of Canes :	12.25 Months.

	Variety.	Cane per Acre, Tons.	Sucrose in Cane, %.	Glucose Ratio.	Purity.	Sucrose in Cane per Acre, Tons.	Sucrose in Cane per Acre, % Mean.
Mean Yields:	D. 241/21	50.92	15.58	3.29	89.8	7.93	128.94
	D. 625	44.61	15.14	3.76	88.4	6.80	110.57
	D. 695/13	44.18	14.82	2.37	88.6	6.55	106 50
	D. 661/21	38.57	15.86	3.03	88.8	6.12	99.51
	D. 835/18	40.96	14.81	4.19	88.6	6.03	98.05
	D. 794/18	41.00	14.29	3.68	87.1	5.84	94.96
	D. 611/18	37.22	15.56	3.25	89.0	5 80	94.31
	D. 613/21	38 96	14.20	3.56	87.0	5.49	89.27
	D. 240/20	31.52	15.09	2.96	88.2	4.76	77.40
	Mean:					6 15	100.00
	Standard Error:					0.37	6.02
	Significant Difference, 20 : 1:					1.13	18.37

The outstanding cane in this trial was D. 241/21. In a field where the glucose ratios indicate that all the canes had reached maturity, and D. 625 gave the very high yield of 6.80 tons sucrose per acre, D. 241/21 outyielded the standard cane by 1.13 tons sucrose, an increase of over 18 per cent. The increment is significant. Under the conditions of this experiment D. 241/21 proved superior in cane and sucrose yield, sucrose content of cane and juice purity. This variety has been tried only once before; in Field 22 B., M.R., at Plantation Lusignan, D. 625 led it by 6 per cent. The authorities at Pln. Port Mourant have made a small commercial extension of D. 241/21.

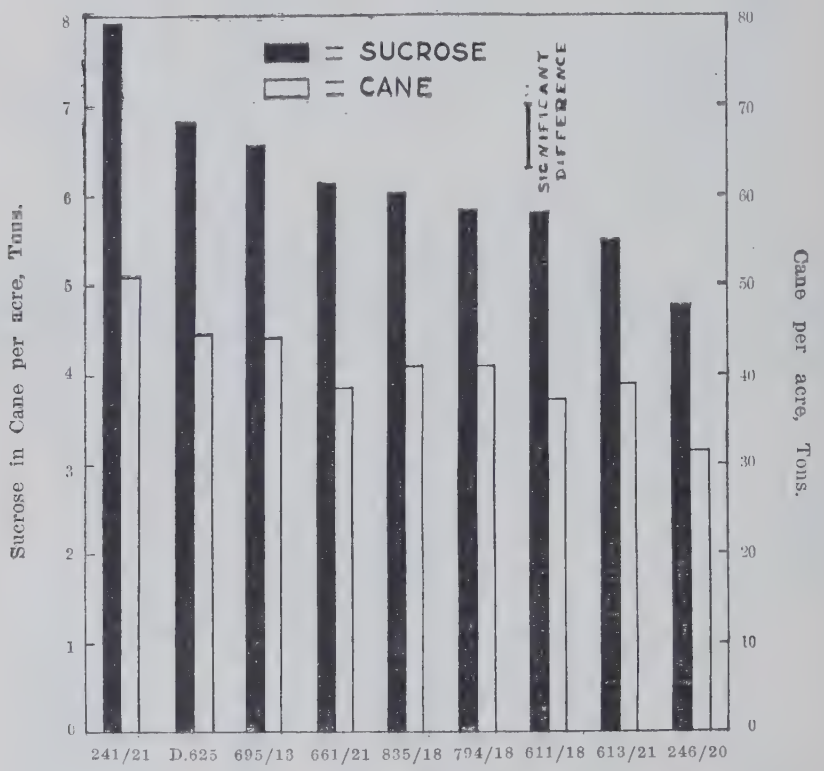

FIG. VI.

Yields of Sucrose and Cane, per Acre, from Field A., O.L., Port Mourant (Plant Canes).

SUMMARY

Three plant cane and three first ratoon variety trials are reported.

The outstanding variety in the plant cane trials was D. 241/21, which gave an excellent cane and sucrose yield at Port Mourant. D. 53/27 also definitely outyielded D. 625 as a plant cane, but there is good reason to believe that this seedling does not ratoon well.

The ratoon trials have disclosed P.O.J. 2878 and D. 207/20 as leading D. 625 by wide, though not significantly different, margins. Both these canes have, so far, also done well as plants.

One of the plant cane trials was designed to give information on the effect of varying row spacings on the growth of D. 625 and D. 53/27. There was no significant difference between the yields from rows 3 ft., 4.5 ft., or 6 ft. apart from centre to centre. Similar results with D. 625 were obtained from Field 14 E., Sophia, last year.

Tables XIV and XV give, respectively, the general means for the varieties in all the experiments in which they have occurred. Since some varieties have had the good fortune to be tested only in high-yielding fields while others have met low-yielding fields, it is of importance, in each table, to pay particular attention to the last column which gives the mean order of merit for the variety in the experiments in which it occurred.

TABLE XIV.

Summary of Results of Plant Cane Experiments from All Stations.

	Variety.		No. of Experiments.	Normal Juice		Cane per Acre, Tons.	Sucrose in Cane. %	Sucrose in Cane per Acre, Tons.	Order of Merit.
				Glucose Ratio.	Purity.				
1	D.	92/17	1	13.61	85.4	51.00	12.92	6.60	1
2	S.W.	3	1	2.17	91.4	40.39	15.95	6.44	1
2	D.	52/20	1	10.10	89.0	49.24	13.08	6.44	2
3	P.O.J.	2878	2	5.61	87.1	42.77	14.25	6.16	1
4	D.	661/21	1	3.03	88.8	38.57	15.86	6.12	4
5	Diamond	10	6	5.42	89.8	38.20	15.68	6 01	2
6	D.	241/21	2	4.45	88.1	40.66	14.29	5.94	2
7	D.	1431/22	1	18.67	83.3	51.56	11.33	5.85	3
8	D.	794/18	1	3.68	87.1	41.00	14.29	5.84	6
9	D.	611/18	1	3.25	89.0	37.22	15.56	5.80	7
10	D.	593/22	1	15.16	85.0	50.00	11.33	5.68	5
11	D.	309/22	2	8.18	86.7	37.87	14.76	5.59	7
12	D.	71/20	1	12.29	85.6	45.80	12.19	5.58	7
13	D.	424/21	4	6.53	88.6	37.31	14.73	5.48	5
14	Diamond	5	1	10.12	87.5	40.86	13.29	5.43	6
15	D.	604/20	1	12.04	86.6	39.78	13.44	5.35	8
16	D.	204/20	2	3.68	90.0	35.28	15.08	5.33	1
16	D.	927/22	2	16.97	81.6	44.12	11.94	5.33	3
16	D.	814/12	2	7.06	87.2	40.92	13.09	5.33	7
17	P.O.J.	1499	1	3.90	87.3	33.94	15.62	5.31	3
18	D.	684/21	2	20.69	77.7	47.51	10.90	5.16	8
19	D.	679/20	1	6.72	88.8	32.29	15.81	5.10	7
20	D.	173/21	1	10.38	87.6	37.77	13.49	5.09	3
21	D.	602/22	10	7.63	87.2	36.14	13.88	5.04	4
22	D.	625	22	10.46	85.1	37.61	13.17	4.97	3
23	P.O.J.	2714	1	6.21	86.6	33.23	14.72	4.89	4
24	D.	666/18	11	10.58	83.8	38.82	12.43	4.84	3
24	D.	53/27	3	9.22	85.5	35.20	13.96	4.84	4
25	D.	403/18	1	5.68	85.5	35.72	13.32	4.76	5
25	D.	246/20	1	2.96	88.2	31.52	15.09	4.76	9
26	D.	744/21	1	3.49	88.6	36.00	13.13	4.73	4
27	P.O.J.	213	2	6.16	85.1	36.70	12.95	4.72	6
28	D.	207/20	1	...	85.4	34.98	13.42	4.69	1
29	D.	835/18	10	8.45	86.2	34.53	13.30	4.63	5
30	D.	573/22	2	4.61	88.3	32.83	13.87	4.57	2
31	D.	663/13	5	0.32	86.7	35.71	12.81	4.56	8
32	D.	1221/22	1	14.54	84.5	41.50	10.93	4.54	9
33	D.	628/21	1	10.69	84.2	35.00	12.90	4.51	1
33	D.	895/22	1	...	84.4	36.05	12.51	4.51	2
34	D.	695/13	7	7.21	87.4	33.61	13.19	4.45	6
35	D.	1034/22	1	4.79	88.5	33.18	13.27	4.40	4
36	D.	1034/21	1	4.10	90.6	30.78	14.06	4.33	5
37	D.	557/20	7	6.03	87.5	32.94	13.08	4.32	6
38	D.	447/17	1	8.02	87.2	30.65	14.03	4.20	2
39	D.	351/20	5	4.85	88.6	30.56	13.63	4.19	4
40	D.	613/21	3	5.51	88.1	31.03	13.17	4.12	10
41	D.	6/21	2	31.62	73.0	41.18	9.89	4.08	6
42	S.C.	12(4)	13	4.86	87.8	30.88	13.03	4.06	7
43	P.O.J.	2727	2	7.59	86.2	29.92	13.04	3.98	6
43	D.	893/21	1	5.75	85.3	38.16	10.44	3.98	8
44	D.	163/21	1	19.74	79.5	38.19	10.23	3.91	5
44	D.	92/21	1	12.49	85.6	29.75	13.14	3.91	6
45	Diamond	17	1	11.51	83.0	32.63	11.81	3.84	4
46	D.	203/20	2	9.73	81.8	34.07	11.40	3.77	5
47	D.	648/22	1	11.23	85.6	31.11	12.05	3.76	9
48	D.	31/17	1	9.37	84.2	27.50	13.38	3.71	4
49	B.H.	10(12)	10	4.99	88.8	26.39	13.65	3.68	6
50	D.	628/20	1	5.59	87.7	23.47	12.89	3.02	7
51	P.O.J.	2725	1	3.66	86.2	21.31	12.35	2.63	8

TABLE XV.

Summary of Results of 1st Ratoon Experiments from all Stations.

	Variety.		Number of Experiments.	Normal Juice.		Cane per Acre, Tons.	Sucrose in Cane, %	Sucrose in cane per Acre, Tons.	Order of Merit.
				Glucose Ratio.	Purity.				
1	Diamond	16	2	8.32	90.0	35.83	14.62	5.61	1
2	D.	684/21	1	23.27	82.2	43.05	12.04	5.20	7
3	D.	814/12	1	8.25	88.7	36.65	14.03	5.13	10
4	D.	666/18	6	15.49	82.9	36.49	12.85	4.69	3
5	Bourbon		2	8.73	87.7	33.41	13.83	4.61	6
6	D.	203/20	2	10.93	86.4	35.42	12.37	4.34	2
7	S.C.	12(4)	8	5.16	90.4	28.64	13.85	4.05	5
8	D.	663/13	2	13.27	87.7	28.26	14.00	3.95	5
9	D.	835/18	6	11.39	85.5	28.65	13.14	3.84	7
10	D.	625	11	13.40	85.2	28.84	13.49	3.83	8
11	B.H.	10(12)	7	4.72	90.4	24.47	15.21	3.76	6
12	Diamond	17	1	11.28	80.6	28.99	12.70	3.68	3
13	D.	73/20	4	8.92	87.2	26.87	13.35	3.61	5
14	D.	628/20	1	11.61	88.4	22.84	15.32	3.50	5
15	D.	207/20	1	5.56	87.4	26.13	12.97	3.39	1
16	P.O.J.	2727	2	4.49	87.1	22.72	13.66	3.14	2
17	P.O.J.	2725	2	3.73	88.7	22.11	13.85	3.11	2
18	D.	927/22	1	5.47	86.6	24.87	12.90	3.06	4
19	P.O.J.	2878	1	8.19	86.8	20.98	14.30	3.01	1
19	D.	695/13	2	5.31	87.5	22.64	13.34	3.01	3
20	D.	557/20	4	8.16	86.4	23.21	12.88	3.00	4
20	D.	896/22	1	5.17	86.8	22.77	13.17	3.00	5
21	D.	1175/22	1	6.73	84.6	23.67	12.38	2.93	6
22	D.	424/21	1	10.54	86.3	20.38	14.27	2.90	3
23	D.	1034/21	1	16.42	86.3	20.80	13.77	2.86	4
24	D.	351/20	5	10.22	87.6	20.43	13.76	2.80	6
25	D.	602/22	1	5.03	87.9	20.65	13.29	2.76	8
26	D.	447/17	1	6.86	88.3	16.96	16.15	2.74	4
26	D.	6/21	1	12.23	80.6	23.84	11.43	2.74	9
27	D.	1034/22	1	12.06	86.3	20.21	13.38	2.70	5
28	D.	893/21	1	10.34	85.2	20.21	13.08	2.66	4
29	D.	689/13	2	12.67	81.3	23.28	11.32	2.61	6
30	D.	238/17	1	9.25	87.2	19.10	13.49	2.58	6
31	D.	573/22	1	7.90	87.7	17.44	14.30	2.50	6
32	D.	383/22	1	15.24	86.9	18.52	13.49	2.49	7
33	D.	31/17	1	14.85	85.1	16.21	15.12	2.45	7
34	D.	744/21	1	12.95	87.3	16.84	14.50	2.43	8
35	D.	789/18	1	15.20	85.9	16.94	13.37	2.27	7
35	D.	376/17	1	14.93	86.6	16.78	13.47	2.27	8
36	D.	75/20	1	14.13	85.2	16.73	13.24	2.22	9
37	D.	204/20	1	11.96	84.8	16.09	13.05	2.10	10
38	D.	918/22	1	10.27	83.3	17.30	11.82	2.03	10
39	D.	571/20	1	10.25	86.9	12.17	14.22	1.73	9
40	D.	699/20	1	7.21	88.8	11.35	15.25	1.72	10

MANURIAL TRIALS.

This section deals with the results of seven manurial trials with sugar cane reaped during the first half of the year 1933.

The method of presentation employed in *Sugar Bulletin* No. 1 has been retained. Thus, two of the experiments here reported are of a complex nature and involve the application of two or more fertilisers. The results from these experiments are discussed under two or more headings.

The analyses of samples of cane from each plot of each experiment, a feature of the work reported in the first Bulletin, has been continued and confirms the finding that applications of fertilisers may markedly affect the sucrose quality of the cane.

A calendar of agricultural operations for each experiment appears in Appendix I. Composite samples of the topsoil and the subsoil of each experimental site were examined in the laboratory ; the results appear in Appendix II.

(A) Experiments with Graded Dressings of Nitrogenous Manures.

(*A1*) *Sulphate of Ammonia on Flooded Front Land Clay (Pln. Port Mourant, First Ratoons).*

The plant cane results of this experiment were reported in *Sugar Bulletin* No. 1 pp. 43—46. The trial involves graded dressings of sulphate of ammonia and of pulverised limestone, in all combinations. The results for the different ground limestone dressings are considered in Section (B).

The topsoil is a markedly acidic clay overlying a slightly acidic clay subsoil. It is well supplied with organic matter with a normal carbon:nitrogen ratio. The subsoil contains a considerable amount of soluble salts. The theoretical lime requirement is low.

The monthly rainfall during the growth period is compared, in Table XVI, with the mean monthly rainfall for the area during preceding years.

TABLE XVI.

Month.	Rainfall, inches.	
	1911-1932.	1932-1933 Excess or deficit.
March	3.52	+ 4.14
April	4.82	+ 9.64
May	8.75	— 3.02
June	9.42	+ 4.32
July	8.83	— 1.90
August	4.83	+ 2.86
September	2.02	+ 0.71
October	2.52	— 0.74
November	3.26	— 3.00
December	8.01	+ 1.14
January	6.95	— 0.94
February	4.67	— 0.35
Total	67.60	+12.86

It will be seen that the first ratoons experienced rainfall above the average for the first half of their growth period. During the second six months the rainfall was slightly below normal.

The results obtained with the first ratoon crop appear in Table XVII and are shown graphically in Figure VII. In this figure the yield curve for the plant cane crop is included for comparison.

TABLE XVII.

Sulphate of Ammonia, Rate per acre.	Cane, Tons per acre.		Sucrose in Cane, per cent.		Sucrose, Tons per acre.	
	Actual.	Per cent. of mean.	Actual.	Per cent. of mean.	Actual.	Per cent. of mean.
6 cwt.	44.76	110.5	13.42	97.9	6.01	108.1
4 cwt.	46.97	115.9	13.52	98.6	6.35	114.2
2 cwt.	41.18	101.6	14.00	102.1	5.77	103.8
nil	29.18	72.0	13.91	101.5	4.06	73.0
Means	40.52	100.0	13.71	100.0	5.56	100.0
S. E. of treatment means	1.672	4.13	0.139	1.01	0.229	4.1
Sig. Differences	4.83	11.91	0.400	2.92	0.662	11.9

"Z" value obtained for effect of sulphate of ammonia on yield of cane = 1.5564

"Z" value obtained for effect of sulphate of ammonia on percentage of sucrose = 0.7247

"Z" value for P = 0.05 ..... = 0.5362

"Z" value for P = 0.01 ..... = 0.7531

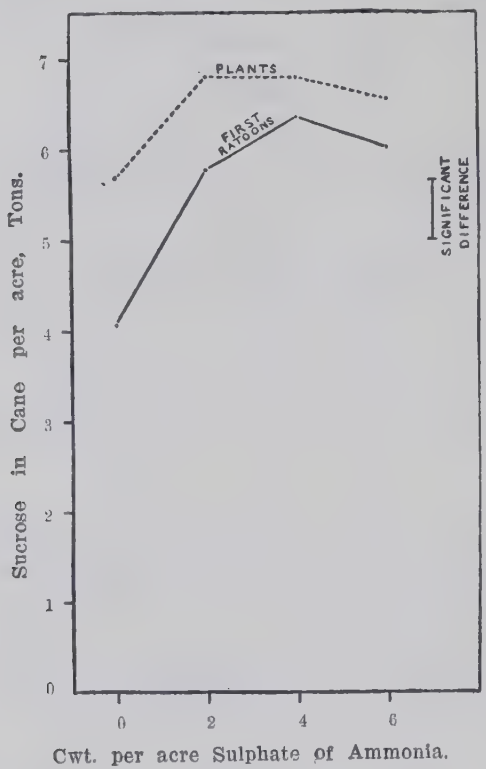

FIG. VII.

Effect of Sulphate of Ammonia on Flooded Front Land Clay (Plants and First Ratoons).

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis of the results indicates that the applications of sulphate of ammonia have had a definite effect upon the sucrose content of the cane, upon the juice purity and upon the glucose ratio. The effect upon the percentage of sucrose in cane is shown in Table XVII. In this table the values for the tons of cane per acre have been multiplied by the appropriate values for the percentage of sucrose in cane in order to obtain figures for the yield of sucrose per acre.

The effects of applications of sulphate of ammonia on the juice purity and on the glucose ratio are shown in Table XVIII.

TABLE XVIII.

Sulphate of Ammonia, Cwt. per acre.	Juice Purity.		Glucose Ratio.	
	Actual.	Per cent. of mean.	Actual.	Per cent. of mean.
6 cwt.	86.52	98.8	8.40	120.0
4 cwt.	86.21	98.5	7.22	103.1
2 cwt.	88.56	101.2	6.40	91.4
nil	88.84	101.5	5.97	85.3
Means	87.53	100.0	7.00	100.0
S.E. of treatment means	0.415	0.47	0.411	5.87
Significant Differences	1.199	1.37	1.187	16.96

"Z" value obtained for effect of sulphate of ammonia on juice purity =1.188
"Z" value obtained for effect of sulphate of ammonia on glucose ratio =0.9575
"Z" value for P=0.05 ..... =0.5362
"Z" value for P=0.01 ..... =0.7531

The general mean analytical figures for the experiment are :—

Purity	...	...	87.53
Glucose Ratio	...	...	7.00
Percentage of Sucrose in the Cane			13.71

Conclusions: Under the conditions of the experiment :—

(a) Dressings of sulphate of ammonia produce increases in the first ratoon crop on flood-fallowed clay soils.

(b) A dressing of 2 cwt. per acre of sulphate of ammonia gives a lower yield of cane than that obtained with a dressing at the rate of 4 cwt. per acre. No definite difference in yield is noted between the 2 cwt. application and the 6 cwt. application.

(c) No difference in yield of cane is noted between the 4 cwt. application and the 6 cwt. application.

(d) An application at the rate of 2 cwt. per acre has no effect on the sucrose content of the cane. Dressings at the rate of 4 cwt. and 6 cwt. per acre reduce the sucrose content of the cane below that obtained with the 2 cwt. application.

NOTE :—A difference between the results of the various treatments, greater than the significant difference, would occur by the chance only five times in every hundred trials. The significant difference in this and other trials is obtained by multiplying the standard error of the difference of two means by the appropriate value of 't' found in Fisher's Table.

(e) While all three rates of application give definite increases in the yield of sucrose per acre (see Figure VII) yet the experiment is not sufficiently precise to justify the statement that the suggestive increase obtained with the 4 cwt. dressing, as compared with that due to the 2 cwt. dressing, is established beyond doubt.

(f) The juice purity definitely deteriorates with the 4 cwt. and 6 cwt. dressings.

(g) Additional dressings of sulphate of ammonia have an increasing effect upon the glucose ratio.

(*A2*) *Sulphate of Ammonia and other Nitrogenous Fertilisers on Unflooded Front Land Fine Silt (Sophia Experiment Station, Second Ratoons).*

The plant cane results of this experiment were published in *The Agricultural Journal of British Guiana*, IV, pp. 10—17 while those of the first ratoon crop were reported in *Sugar Bulletin* No. 1, pp. 46—49. This trial involves graded dressings of sulphate of ammonia and applications of two organic nitrogenous manures, namely, Kerazotine and Leathermeal. No manurial applications were made to the second ratoons.

The soil of the area is a markedly acidic fine silt, overlying a similar subsoil.

The monthly rainfall during the growth period is compared in Table XIX with the mean monthly rainfall for the area for preceding years.

TABLE XIX.

Month.	Rainfall, inches. 1921-1932.	1932-1933 Excess or deficit.
March	3.97	+ 2.60
April	5.05	+10.26
May	11.81	+ 1.52
June	14.67	+ 0.27
July	10.80	— 3.70
August	8.23	— 1.39
September	2.85	— 2.40
October	3.92	— 0.03
November	5.73	— 5.64
December	14.43	+ 1.97
January	7.26	+ 0.30
February	3.53	+ 1.24
Total	92.25	+ 5.00

The yields obtained with the second ratoon crop are shown in Table XX.

TABLE XX.

Fertiliser.	Nitrogen, lbs. per acre. Plants	1st Ratoons	2nd Ratoons	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Sulphate of Ammonia	90	120	nil	9.37	1.25	107.8
" " "	75	80	nil	9.10	1.21	104.3
" " "	60	40	nil	7.91	1.06	91.4
Kerazotine	60	40	nil	7.85	1.05	90.5
Leathermeal	60	40	nil	9.34	1.25	107.8
Means	—	—	—	8.71	1.16	100.0
S. E. of treatment means	—	—	—	0.648	0.086	7.44
Significant Differences	—	—	—	2.13	0.28	24.46

"Z" value obtained for effect of treatments on yield of cane..... =0.1666
"Z" value required for P=0.05..... =0.5907

The residual effects of various dressings are, therefore, *not* statistically significant.

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the figures for the percentage of sucrose in the cane indicates that the various treatments have had no definite effect upon the sucrose content of the cane. It is obvious from the run of the figures for the juice purity and for the glucose ratio that the treatments have had no significant effect upon juice quality. Values for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage of sucrose in cane (13.34%) in order to obtain values for the tons of sucrose per acre.

The general mean analytical figures for the experiment are:—

Purity	...	...	89.5
Glucose Ratio	...	...	6.16
Percentage of Sucrose in the Cane			13.34

The random variation over the experimental area is high and precludes the definite measurement of such small differences as occurred in this experiment. The trial contains no control plots and in their absence it is impossible to say whether the dressings had, or did not have, a residual effect upon the ratoon crop. *Conclusions:* Under the prevailing conditions of the experiment:—

(a) No definite difference in residual effect, on the second ratoon crop is to be noted between varied applications of sulphate of ammonia and dressings of certain organic nitrogenous manures applied to the plant canes and first ratoons.

(A3) Sulphate of Ammonia and other Nitrogenous Fertilisers on Unflooded Front Land Heavy Silt (Pln. Blairmont, Second Ratoons).

The plant cane results of this experiment were published in the *Agricultural Journal of British Guiana* IV, 2, pp. 59-63 while the results of the first ratoon crop appeared in *Sugar Bulletin* No. 1, pp. 49-52. As in the case of experiment A (2) this trial involves graded dressings of sulphate of ammonia and certain dressings of organic manures. No organic manures were applied to the second ratoon crop. Attempts were made instead, to investigate any residual effects accruing from the applications made to the plant canes and to the first ratoons.

The topsoil of the experimental area is a highly acidic heavy silt, overlying a highly acidic fine silt subsoil. It possesses a fair amount of organic matter with a normal carbon:nitrogen ratio. The soil contains an average amount of soluble salts. The theoretical lime requirement is high.

The monthly rainfall during the growth period is compared in Table XXI with the mean monthly rainfall for the area during the preceding years.

TABLE XXI.

Month.	Rainfall, inches.	
	1911-1932.	1932-1933 Excess or deficit.
April	5.83	+13.39
May	10.55	+ 0.65
June	12.25	— 0.47
July	10.22	— 2.89
August	6.43	+ 0.40
September	2.24	— 0.06
October	2.51	— 0.57
November	3.55	— 3.52
December	9.60	+ 0.91
January	8.86	— 1.18
February	4.86	+ 0.88
March	4.63	+ 0.45
Total	81.53	+ 7.99

It will be seen that the young shoots experienced very heavy rainfall. During the rest of the growing season the rainfall was, with the exception of a very dry November, normal.

The yields obtained with the second ratoon crop are shown in Table XXII and are depicted graphically in Figure VIII.

TABLE XXII.

Fertiliser.		Nitrogen, lbs. per acre. Plants.	1st Ratoons.	2nd Ratoons.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Sulph. of Ammonia	F*	120[1]	120[1]	120[1]	18.51	2.58	115.2
" " "	C	120[2]	120[2]	nil	13.20	1.84	82.1
" " "	E	80	80	80	18.48	2.58	115.2
" " "	D	40	40	40	17.78	2.48	110.7
Leathermeal	G	40	40[3]	120[2,3]	18.41	2.57	114.7
Kerazotine	B	40	40	nil	13.29	1.85	82.6
Control	A	nil	nil	nil	12.88	1.80	80.4
Means		—	—	—	16.08	2.24	100.0
S. E. of treatment means		—	—	—	0.97	0.136	6.1
Significant Differences		—	—	—	3.00	0.419	18.7

"Z" value obtained for effect of treatment on yield of cane..... =1.048
"Z" value required for P=0.01..... =0.6226

The effect of the various dressings on the yield of sucrose is, therefore definitely significant.

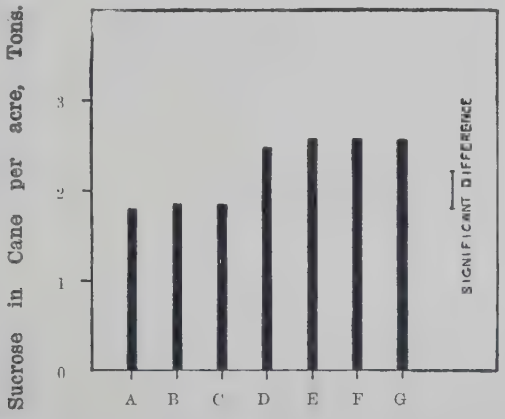

FIG. VIII.

Effect of Nitrogenous Manures on Unflooded Front Land Fine Silt (Second Ratoons).

1 In one dose.
2 In two doses.
3 Sulphate of ammonia substituted.
*Letters refer to Figure VIII.

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the results indicates that the treatments have had no definite effect upon the percentage of sucrose in the cane. Figures for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage of sucrose in cane (13.95%) in order to obtain values for the tons of sucrose per acre.

Further statistical examination shows that the various treatments have had a measureable effect upon the juice purity but have had no definite effect upon the glucose ratio. The effect of treatment on the juice purity figures is considered in detail in Table XXIII.

TABLE XXIII.

Fertiliser.	Nitrogen, lbs. per acre.			Juice Purity.	
	Plants.	1st Ratoons.	2nd Ratoons.	Actual.	Per cent. of mean.
Sulph. of Ammonia	120[1]	120[1]	120[1]	87.24	99.2
" " "	120[2]	120[2]	nil	89.30	101.6
" " "	80	80	80	87.13	99.1
" " "	40	40	40	87.16	99.1
Leathermeal	40	40[3]	120[2,3]	85.76	97.5
Kerazotine	40	40	nil	89.10	101.3
Control	nil	nil	nil	89.80	102.1
Means	—	—	—	87.93	100.0
S. E. of treatment means	—	—	—	0.807	0.92
Significant Differences	—	—	—	2.49	2.84

"Z" value obtained for the effect of treatment on juice purity.....=0.6077
"Z" value required for P=0.05.....=0.4420

The general mean analytical figures for the experiment are :—

Purity	87.93
Glucose Ratio	11.78
Percentage of Sucrose in the Cane	13.95

The figure obtained for the glucose ratio indicates that the cane was not mature.

Conclusions : Under the prevailing conditions of the experiment :

(a) Dressings of sulphate of ammonia to second ratoons have a definite effect upon the yield of cane and upon the juice purity. They are without measurable effect upon the sucrose content of the cane.

(b) Dressings of certain organic nitrogenous manures and heavy applications of sulphate of ammonia to the plant canes and to the first ratoons have no significant residual effect upon the second ratoon yield or upon the juice purity.

[1] In one dose.
[2] In two doses.
[3] Sulphate of ammonia substituted.

(c) There are no definite differences in the yield of cane due to dressings of sulphate of ammonia at the following rates; 40 lbs., 80 lbs., 120 lbs. of nitrogen per acre.

(d) A dressing of sulphate of ammonia at the rate of 120 lbs. of nitrogen per acre divided into two equal applications does not give a measurable increase in yield over that obtained by applying the whole dressing at one time.

(e) The divided heavy dressing of sulphate of ammonia produces a juice of lower purity than that obtained from the canes receiving no nitrogenous application.

(f) Applications of nitrogenous fertilisers to second ratoons produce juices of lower purity than that obtained from the cane receiving no nitrogenous manure during its life cycle.

(A4) Sulphate of Ammonia and an Organic Nitrogenous Manure on Unflooded Front Land Heavy Silt (Sophia Experiment Station, Plant Canes).

This experiment involves varied dressings of sulphate of ammonia and an application of Bacterised Peat supplied for trial by the makers.

Composite samples of the topsoil and the subsoil of the experimental area were examined in the laboratory. The topsoil of the experimental area is a markedly acidic heavy silt overlying a markedly acidic clay. It contains an average amount of organic matter with a carbon : nitrogen ratio slightly wider than usual. The topsoil and subsoil, at the time of sampling, contained a considerable amount of soluble salts. The theoretical lime requirement is low.

The monthly rainfall during the growth period and the mean monthly rainfall for the area for preceding years are compared in Table XXIV.

TABLE XXIV.

Month.	Rainfall, inches. 1921-1932.	1932-1933 Excess or deficit.
February	3.53	— 2.41
March	3.97	+ 2.60
April	5.05	+10.26
May	11.81	+ 1.52
June	14.67	+ 0.27
July	10.80	— 3.70
August	8.23	— 1.39
September	2.85	— 2.40
October	3.92	— 0.03
November	5.73	— 5.64
December	14.43	+ 1.97
January	7.26	+ 0.30
February	3.53	+ 1.24
March	3.97	+ 1.46
April	5.05	+ 0.31
Total	104.80	+ 4.36

It will be seen that the crop at first experienced excess rainfall ; that during the middle growth period precipitation was below normal and that during the ripening period the rainfall was above the average.

The plant cane yields are shown in Table XXV and are graphically represented in Figure IX.

TABLE XXV.

Treatment, per acre.		Nitrogen, lb. per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Sulphate of Ammonia,	6 cwt.	140	40.76	5.53	101.8
" " " *	6 cwt.	140	42.58	5.77	106.3
" " "	3 cwt.	70	42.81	5.80	106.8
Bacterised Peat,	1 ton	160	37.32	5.06	93.2
Control	nil	0	36.80	4.99	91.9
Means	...	...	40.05	5.43	100.0
S.E. of treatment means	...	...	1.469	0.199	3.67
Significant Differences	...	...	4.36	0.59	10.89

"Z" value obtained for effect of treatment on yield of cane..... = 0.6631
For P = 0.05 the required "Z" value..... = 0.4947

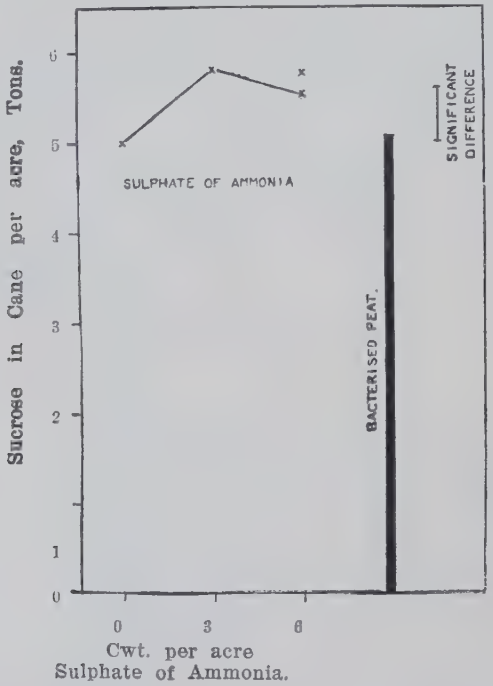

FIG. IX.
Effect of Nitrogenous Manures on Unflooded Front Land Heavy Silt (Plant Canes).

* In two equal doses.

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the results indicates that the various treatments have had no effect upon the percentage of sucrose in the cane, upon the juice purity nor upon the glucose ratio. The figures for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage sucrose in cane (13.56%) in order to obtain values for the tons of sucrose per acre.

The general mean analytical figures for the experiment are :—

Purity	...	...	86.7
Glucose Ratio	...	...	8.87
Percentage of Sucrose in the Cane		...	13.56

The price of the Bacterised Peat used in the experiment was $48.00 per ton, c.i.f. Georgetown.

Conclusions : Under the conditions of the experiment :—

(a) A dressing of Bacterised Peat at the rate of one ton per acre has had no effect upon the plant cane yields.

(b) A dressing of sulphate of ammonia at the rate of 3 cwt. per acre gives a definite increase in yield over the control plot and over the plots dressed with Bacterised Peat.

(c) The split dressing of sulphate of ammonia, 3 cwt. per acre at planting and a further 3 cwt. per acre six weeks after planting, gives no increased yield over that obtained with the single dressing at the rate of 3 cwt. per acre. The split dressing gives a definitely increased yield over the control plots and over the areas dressed with Bacterised Peat.

(d) Under the climatic conditions prevailing and with the cane variety used, a single dressing of 6 cwt. per acre of sulphate of ammonia gives a yield which is not significantly different from the yields obtained from any of the other treatments. It seems probable, under the circumstances, that a single dressing of 6 cwt. per acre of sulphate of ammonia provides an overdose of nitrogen.

(e) None of the treatments have had a definite effect on the sucrose quality of the cane, the juice purity or on the glucose ratio.

(f) The Bacterised Peat employed contains approximately 7% of nitrogen, on the air-dry basis. The dressing at the rate of one ton per acre therefore furnishes some 160 lbs. of nitrogen. It is conceivable that the cane on the plots dressed with Bacterised Peat received an overdose of nitrogen. The present experiment does not indicate whether the nitrogen of the Bacterised Peat is unavailable or too readily available. (It should be mentioned that the Agents supplying the Peat advised applications at the rate of one ton per acre.)

(*A5*) *Sulphate of Ammonia on Unflooded Front Land Heavy Silt (Sophia Experiment Station, Plant Canes).*

That large dressings of sulphate of ammonia applied to the heavy soils of the Colony's sugar cane lands may have a residual effect, was pointed out by the Agricultural Advisor to the Colonial Office during his recent visit. Experience with the heavy clay soils of the Sudan was cited as an example.

This experiment is designed to furnish information on this point. The trial involves two treatments of sulphate of ammonia at the rate of 6 cwt. per acre, two treatments of sulphate of ammonia at the rate of 3 cwt. per acre and a control treatment. Naturally the plant cane results present no evidence concerning residual effects; such information will become available when succeeding ratoon crops are reaped.

The experimental area is contiguous to that of the previous experiment A (4) and one set of composite samples were collected from the two sites. The results of their laboratory examination have been discussed on a previous page.

The monthly rainfall during the growth period is compared in Table XXVI with the mean monthly rainfall for preceding years.

TABLE XXVI.

Month.	Rainfall, inches.	
	1921-1932	1932-1933 Excess or deficit.
March	3.97	+ 2.60
April	5.05	+ 10.26
May	11.81	+ 1.52
June	14.67	+ 0.27
July	10.80	— 3.70
August	8.23	— 1.39
September	2.85	— 2.40
October	3.92	— 0.03
November	5.73	— 5.64
December	14.43	+ 1.97
January	7.26	+ 0.30
February	3.53	+ 1.24
March	3.97	+ 1.46
April	5.05	+ 0.31
Total	101.27	+ 6.77

It will be seen that the young cane experienced excessive rainfall. During the middle period of growth the precipitation was below the normal, while during the latter period the rainfall was above the average.

The yields obtained with the plant cane crop are shown in Table XXVII and are represented graphically in Figure X.

TABLE. XXVII.

Sulphate of Ammonia, Cwt. per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Percent. of mean.
6 cwt.	41.03	5.84	114.6
6 cwt. (R)*	39.50	5.62	110.4
3 cwt.	33.82	4.82	94.5
3 cwt. (R)*	35.59	5.07	99.4
nil.	29.02	4.13	81.1
Means	35.79	5.10	100.0
S.E. of treatment means	1.229	0.175	3.44
Significant Differences	3.79	0.540	10.59

"Z" value obtained for the effect of treatment on yield of cane..... = 1.3550
"Z" value required for P = 0.01..... = 0.7197

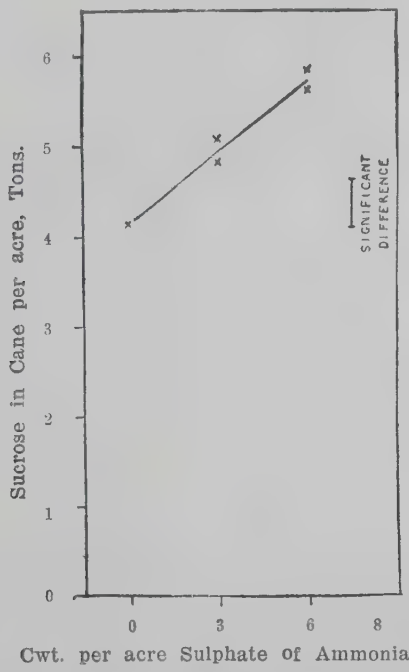

FIG. X.
Effect of Sulphate of Ammonia on Unflooded Front Land Heavy Silt (Plant Canes).

*Treatments made to the plant canes only in order to test residual effects.

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the results indicates that the various treatments have had no effect upon the percentage of sucrose in the cane, upon the juice purity nor upon the glucose ratio. The figures for the tons of cane have consequently been multiplied by the general mean figure for the percentage of sucrose in cane (14.24%) in order to obtain values for the tons of sucrose per acre.

The general mean analytical figures for the experiment are :—

Purity	...	87.6
Glucose Ratio	...	6.90
Percentage of Sucrose in the Cane	...	14.24

It is of considerable interest to compare the results of this fertiliser trial, using the seedling Diamond 10, with the results of the trial, previously reported, using the seedling D.602/22.

The previous experiment indicates that the variety D.602/22, as a plant cane, can utilise efficiently only the nitrogen obtained from a dressing of sulphate of ammonia at the rate of 3 cwt. per acre. The variety Diamond 10 appears to be capable of utilising efficiently much greater amounts of nitrogen. The present experiment does not indicate the maximum nitrogen consumption of Diamond 10 plant cane. It is apparent, however, that on unflooded soil this variety can utilise the nitrogen in heavier dressings of sulphate of ammonia than 6 cwt. per acre.

Conclusions :—Under the conditions of the experiment :—

(a) Dressings of sulphate of ammonia have a very definite effect upon the yield of cane but are without effect upon the sucrose content, the juice purity and the glucose ratio ;

(b) Dressings of sulphate of ammonia at the rate of 3 cwt. per acre give a significant increase in yield of cane ;

(c) Dressings of sulphate of ammonia at the rate of 6 cwt. per acre give a definite increase in yield over that obtained with a dressing at the rate of 3 cwt. per acre ;

(d) Diamond 10 variety seems to be capable of utilising efficiently heavier dressings of sulphate of ammonia than does variety D.602/22.

(*A6*) *Sulphate of Ammonia on Pegassy Clay* (*Pln. Farm, First Ratoons*).

The results of the plant cane crop of this experiment were presented in *Sugar Bulletin* No. 1, pp. 57-60. The experiment involves graded dressings of sulphate of ammonia and of ground limestone in all combinations. A few treatments of sulphate of potash are included. The size of the experimental area did not permit the use of potassic manure at all levels of the other fertilisers.

The soil of the area is a highly acidic pegassy clay. It contains a considerable amount of organic matter of wide carbon : nitrogen ratio. The amount of soluble salts present is low. The theoretical lime requirement is high.

The monthly rainfall during the growth period is compared in Table XXVIII with the mean monthly rainfall for the area for preceding years.

TABLE XXVIII

Month.	Rainfall, inches. 1906-1932.	1932-1933 Excess or deficit.
April	7.18	+ 8.25
May	13.56	+ 0.81
June	14.34	+ 5.77
July	11.94	— 0.83
August	8.57	+ 3.21
September	3.71	— 3.32
October	3.59	— 2.57
November	5.85	— 3.24
December	11.84	— 0.12
January	8.46	— 2.28
February	5.25	— 0.07
March	6.79	— 0.76
April	7.18	— 0.08
Total	108.26	+ 4.77

It will be seen that the plant cane crop was reaped during heavy weather and that during the initial stages the cane experienced excessive rainfall. During the middle period of growth precipitation was below the average, while in the later period the rainfall was normal.

The results of the first ratoon crop appear in Table XXIX and are also graphically represented in Figure XI.

TABLE XXIX.

Fertiliser.	Rate per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Sulphate of Ammonia	6 cwt.	19.69	2.98	110.0
" " "	4 cwt.	18.42	2.79	103.0
" " "	2 cwt.	18.34	2.77	102.5
Control	nil	15.10	2.28	84.4
Means	—	17.89	2.71	100.0
S. E. of treatment means	—	0.571	0.086	3.19
Significant Differences	—	1.65	0.249	9.22

"Z" value obtained for effect of nitrogen on yield of cane..... =1.2329
"Z" value required for P=0.01..... =0.7086

The dressings of nitrogen therefore have a very definite effect on the yield of cane.

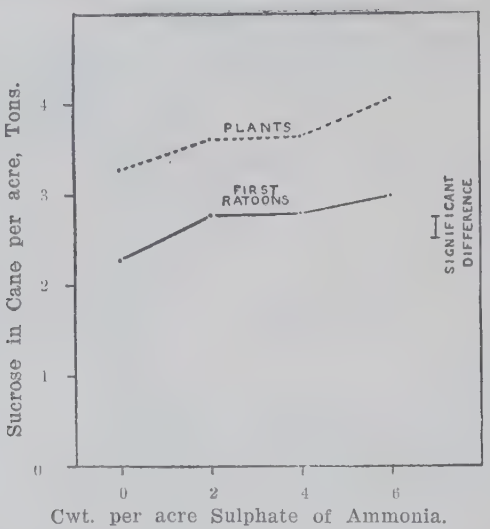

FIG. XI.

Effect of Sulphate of Ammonia on Pegassy Clay (Plants and First Ratoons).

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis of the results shows that the treatments of sulphate of ammonia were without effect upon the sucrose content of the cane. Values for the tons of cane per acre have consequently been multiplied by the general mean figure for the percentage of sucrose in the cane (15.13%).

Further statistical analysis shows that the varied dressings of sulphate of ammonia have had no effect upon the juice purity nor on the glucose ratio.

No interaction between the varied dressings of sulphate of ammonia and the ground limestone or the sulphate of potash is to be noted.

The general mean analytical figures for the experiment are :—

Purity	90.06
Glucose Ratio	6.99
Percentage of Sucrose in the Cane	15.20

Conclusions : Under the conditions of the experiment :—

(a) Dressings of sulphate of ammonia produce increases in the first ratoon crop on pegassy clay soils;

(b) The yields obtained with a dressing of 4 cwt. per acre or 6 cwt. per acre of sulphate of ammonia do not differ significantly from that obtained with a dressing at the rate of 2 cwt. per acre;

(c) The varied dressings of sulphate of ammonia have *no* definite effect upon (i) the sucrose content of the cane, (ii) the juice purity, and (iii) the glucose ratio ;

(d) There is no definite interaction between the graded dressings of sulphate of ammonia and those of pulverised limestone ;

(e) No interaction is to be noted between the graded dressings of sulphate of ammonia and that of sulphate of potash.

(B) Experiments with Lime-Bearing Materials.

(*B 1*) *Ground Limestone in the Row on Flooded Front Land Clay (Pln. Port Mourant, First Ratoons).*

This experiment involves graded dressings of ground limestone and graded applications of sulphate of ammonia in all combinations. The results of the plant cane crop were presented in *Sugar Bulletin* No. 1, p. 61.

The nature of the experiment, the calendar of agricultural operations and the rainfall for the experimental period have already been described.

The effects of the application of sulphate of ammonia are described under Exp. A (1).

The yields of the first ratoon crop appear in Table XXX.

Table XXX.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Ground limestone	6	41.39	5.67	102.1
„ „	3	41.09	5.63	101.4
„ „	1	40.32	5.53	99.5
Control	0	39.30	5.39	97.0
Means	—	40.52	5.56	100.0
S.E of treatment means	—	1.672	0.229	4.13
Significant Differences	—	4.83	0.662	11.91

The "Z" value obtained for the effect of treatment on yield of cane is a negative value.

The various applications of limestone at planting have, therefore, had *no* significant residual effect upon the yield of the first ratoon crop.

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the results indicates that dressings of ground limestone at planting have had no effect on the sucrose content of the

cane, the juice purity nor on the glucose ratio of the first ratoons. The figures for the tons of cane have consequently been multiplied by the general mean value for the percentage of sucrose in the cane (13.71%) in order to obtain the values for the sucrose per acre.

Conclusions :—Under the conditions of the experiment :—

Dressings of ground limestone, applied at planting, have *no* definite residual effect in the first ratoon crop on the yield of cane, the precentage of sucrose in the cane, the juice purity nor on the glucose ratio.

(*B 2*) *Ground Limestone and Agricultural Slaked Lime in the Row on Flooded Front Land Clay*

(*Pln Leonora, First Ratoons*).

This experiment involves graded dressings of pulverised limestone and graded dressings of agricultural slaked lime applied before planting. The present report is concerned with possible residual effects on the first ratoon crop.

The experiment has been described and the plant cane results have recently been reported in *Sugar Bulletin* No. 1, pp. 62—63.

The monthly rainfall during the experimental period is compared in Table XXXI with the mean monthly rainfall for preceding years.

TABLE XXXI.

Month.	Rainfall, inches.	
	1906-1932.	1932-1933. Excess or deficit.
June	12.50	— 0.18
July	11.07	— 0.27
August	7.18	— 2.04
September	2.94	— 1.26
October	3.27	— 1.79
November	6.23	— 5.92
December	11.63	+ 1.60
January	8.65	— 2.31
February	4.99	+ 0.14
March	5.42	+ 0.26
April	5.60	— 0.82
Total	79.48	—12.59

It will be seen that the rainfall during the whole of the growth was generally below normal.

The yields obtained with the first ratoon crop appear in Table XXXII.

TABLE XXXII.

Fertiliser.	Rate, Tons per acre.	Cane, Tons per acre.	Sucrose, Tons per acre.	Per cent. of mean.
Ground Limestone	5	27.48	3.50	100.8
" "	2	27.11	3.46	99.4
" "	1	26.11	3.33	95.7
Slaked Lime	5	28.55	3.64	104.7
" "	2	26.85	3.42	98.4
" "	1	28.42	3.62	104.2
Control	nil	26.46	3.37	97.0
Means	—	27.27	3.48	100.0
S. E. of treatment means	—	0.815	0.104	2.99
Significant Differences	—	2.39	0.315	8.76

"Z" value obtained for effect of quality on yield of cane.....=0.4168
"Z" value obtained for effect of quantity on yield of cane.....=negative
"Z" value obtained for interaction of quantity and quality.....=0.0688
"Z" value required for P=0.05 (quality).....=0.6933
"Z" value required for P=0.05 (interaction).....=0.5738

Statistical examination of the results obtained indicates that neither the quantity of the lime-bearing material nor its quality has had any definite effect upon the yield of cane.

It was not found possible in this experiment to analyse samples of cane from the individual plots. Bulked samples, representative of each treatment, were ground and analysed at Sophia Experiment Station. The figures for the tons of cane have been multiplied by the general mean value for the percentage of sucrose in the cane (12.75%) in order to obtain values for the tons of sucrose per acre.

The general mean analytical figures for the experiment are :—

Purity	...	...	82.7
Glucose Ratio	...	...	17.96
Percentage of Sucrose in the Cane		...	12.75

It is apparent that the cane was immature when reaped.

Conclusions :—Under the conditions of the experiment :—

(a) Dressings of lime-bearing materials, applied in the row at planting, have *no* residual effect upon the yield of first ratoon cane ;

(b) *No* distinction can be drawn between the efficiency of ground limestone and agricultural slaked lime.

(*B 3.*) *Ground Limestone in the Row on Pegassy Clay, (Pln. Farm, First Ratoons).*

This experiment involves graded dressings of sulphate of ammonia, ground limestone and certain applications of sulphate of potash. The yields of the plant cane crop appeared in *Sugar Bulletin* No. 1, pp. 70-73, while the effects of the various applications of sulphate of ammonia on the first ratoon crop have already been considered in this publication (Exp. A6). The results here considered relate to the residual effects of graded dressings of ground limestone, applied at planting, on the first ratoon crop.

The nature of the experiment, the character of the soil, the calendar of agricultural operations and the rainfall data have already been described.

The results of the first ratoon crop appear in Table XXXIII and are graphically represented in Figure XII.

TABLE XXXIII.

Ground limestone, Tons per acre.	Cane, Tons per acre.		Sucrose in Cane, per cent.		Sucrose, Tons per acre.	
	Actual.	Per cent. of mean.	Actual.	Per cent. of mean.	Actual.	Per cent. of mean.
8	20.11	109.8	15.38	101.2	3.09	111.2
4	18.08	98.7	15.52	102.1	2.81	101.2
1	18.66	101.9	15.19	99.9	2.83	101.8
nil	16.45	89.8	14.70	96.7	2.42	87.0
Means	18.32	100.0	15.20	100.0	2.78	100.0
S. E. of treatment means	0.511	2.79	0.143	0.94	0.078	2.79
Significant Differences	1.47	8.05	0.423	2.78	0.224	8.05

"Z" value obtained for effect of ground limestone on yield of cane..... =1.0865

"Z" value obtained for effect of ground limestone on sucrose content of cane..... =0.8880

"Z" value required for P. =0.01..... =0.7086

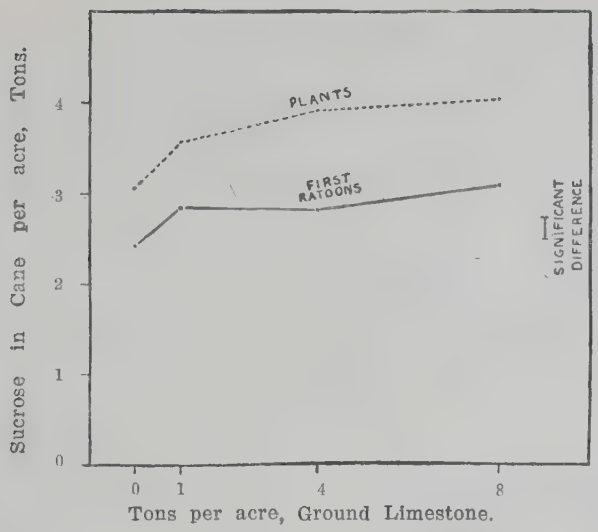

FIG. XII.

Effect of Ground Limestone on Pegassy Clay (Plants and First Ratoons).

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical examination of the results shows that the dressings of ground limestone have had a very definite effect upon the sucrose content of the cane. The figures for the tons of cane per acre have consequently been multiplied by the appropriate values for the percentage of sucrose in the cane in order to obtain figures for the tons of sucrose per acre.

Further statistical examination indicates that the dressings of ground limestone have had a definite effect upon the juice purity but have not affected the glucose ratio.

The results obtained for the juice purity of the first ratoon crop are shown in Table XXXIV.

TABLE XXXIV.

Ground Limestone, Tons per acre.	Juice Purity, Actual.	Juice Purity, Per cent. of mean.
8	90.31	100.3
4	90.59	100.6
1	90.05	100.0
nil	89.25	99.1
Means	90.06	100.0
S. E. of treatment means	0.239	0.266
Significant Differences	0.694	0.771

"Z" value obtained for effect of limestone on juice purity.....=0.8939
"Z" value required for P. =0.01.....=0.7086

Conclusions ;—Under the experimental conditions ;—

(a) Ground limestone, applied in the row at planting, has a significant residual effect upon the yield of cane in the first ratoon crop;

(b) No definite difference is to be noted between the yield of cane obtained with the 1 ton per acre dressing and those obtained with the dressings at the rate of 4 tons per acre and 8 tons per acre;

(c) The yield of cane obtained with a dressing at the rate of 8 tons per acre is significantly greater than that obtained with the 4 tons per acre dressing;

(d) Dressings of ground limestone, applied in the row at planting, increase the sucrose content of the first ratoons ;

(e) No differences are to be noted between the effects of the varied dressings of ground limestone on the sucrose content of the cane ;

(f) Dressings of ground limestone, applied in the row at planting, have a definite residual effect upon the yield of sucrose in the first ratoon crop ;

(g) No difference between the yields of sucrose from the 1 ton per acre dressing and the 4 tons per acre dressing is to be noted ;

(h) A dressing of ground limestone at the rate of 8 tons per acre, in the row at planting, gives a definitely higher yield of sucrose in the first ratoons than do similar dressings at the rates of 1 ton per acre and 4 tons per acre ;

(i) Dressings of ground limestone, at planting, improve the juice purity of the first ratoon crop, but no differences are to be noted between the effects of the varied doses;

(j) Dressings of ground limestone at planting have no effect on the glucose ratio of the first ratoon crop.

(C) Experiments with Phosphatic Manures.

No experiments involving the application of phosphatic manures have been reaped during the period under review.

(D) Experiments with Potassic Manures.

(*D1*) *Sulphate of Potash on Pegassy Clay* (*Pln. Farm, First Ratoons*).

This experiment, which involves graded dressings of ground limestone and of sulphate of ammonia, also includes certain dressings of sulphate of potash. Lack of space prevented the inclusion of potash treatments in every possible combination. The experiment consequently gives information concerning the effect of an application of sulphate of potash, in combination with a small dressing of sulphate of ammonia, at different levels of limestone application.

The results of the plant cane crop are presented in *Sugar Bulletin* No. 1 pp. 79-81. The results of the first ratoon crop have, in part, been described in the present publication (Exp. A6) and (Exp. B3),

The character and conditions of the experiment have already been described. An application of sulphate of potash was made to the first ratoons as well as to the plant canes.

The results of the first ratoon crop are presented in Table XXXV and are shown graphically in Figure XIII.

TABLE XXXV.

Fertiliser.	Cane, Tons per acre.		Sucrose in Cane, per cent.		Sucrose, Tons per acre.	
	Actual.	Per cent. of mean.	Actual.	Per cent. of mean.	Actual.	Per cent. of mean.
2 cwt/acre Sulphate of Ammonia and 2 cwt/acre Sulphate of Potash	20.07	104.5	15.47	101.6	3.10	106.2
2 cwt/acre Sulphate of Ammonia	18.34	95.5	15.00	98.4	2.75	94.2
Means	19.20	100.0	15.23	100.0	2.92	100.0
S. E. of treatment means	0.571	2.97	0.164	1.08	0.087	2.97
Significant Differences	1.649	8.59	0.473	3.11	0.251	8.59

"Z" value obtained for effect of potash on yield of cane..... = 0.7586
"Z" value obtained for effect of potash on sucrose content of cane..... = 0.7160
"Z" value obtained for P = 0.05..... 0.6933

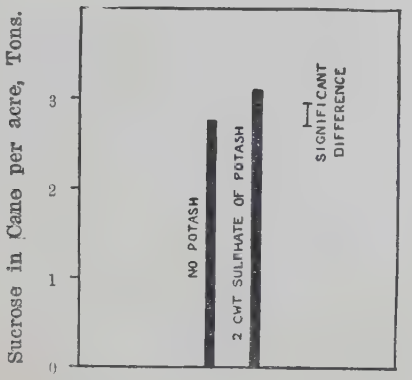

FIG. XIII.

Effect of Sulphate of Potash on Pegassy Clay (First Ratoons).

Samples of cane from each plot were ground and analysed at Sophia Experiment Station. Statistical analysis indicates that the dressing of sulphate of potash has definitely improved the sucrose content of the cane. The figures for the yield of cane have consequently been multiplied by the appropriate values for the percentage of sucrose in cane in order to obtain figures for the yield of sucrose per acre.

Further statistical analysis indicates that the potassic dressings have improved the juice purity but are without effect upon the glucose ratio.

The results obtained for the effect of potassic dressings on the juice purity of the first ratoon canes are presented in Table XXXVI.

TABLE XXXVI.

Fertiliser.	Juice purity.	
	Actual.	Per cent.
2 cwt/acre Sulphate of Ammonia and 2 cwt/acre Sulphate of Potash	90.92	100.7
2 cwt/acre Sulphate of Ammonia	89.68	99.3
Means	90.30	100.0
S.E. of treatment means	0.268	0.297
Significant Differences	0.779	0.862
"Z" value obtained for effect of potash on juice purity		=1.1910
"Z" value required for P =0.01		=0.9784

Conclusions : Under the experimental conditions :—

(a) A dressing of sulphate of potash given to the first ratoons, in the presence of a single dressing of sulphate of ammonia, improves the yield of cane, the sucrose content of the cane, the yield of sucrose and the juice purity. It is without effect upon the glucose ratio.

(b) No interaction is to be noted between the potassic dressings and the varied applications of ground limestone.

DISCUSSION.

The present Bulletin contains the results of seven manurial trials reaped during the first half of the year 1933. It was remarked in *Sugar Bulletin* No. 1 that certain environments were represented by only one experiment and that it would be unwise to attempt to apply the results of only one experiment under one of these conditions to the whole of the Colony. This stricture still applies to our experimental results, but a multiple scheme of trials with sulphate of ammonia has been established and should provide definite information.

Sulphate of Ammonia.

In the one experiment with graded dressings of sulphate of ammonia on *flood-fallowed front land clay* (Exp. A1) it appears that a dressing at the rate of 4 cwt. per acre undoubtedly gives the heaviest yield of first ratoon cane. It is apparent, however, that such a dressing impairs the sucrose quality and the juice purity of the cane. When, therefore, the yield of sucrose per acre is considered it is found that the experiment is not sufficiently precise to indicate, beyond doubt, that the 4 cwt. application is the optimum. Such dressings should, however, be made the subject of estate trials. Incidentally this experiment affords field confirmation to the laboratory finding that the process of flood-fallowing increases the ammonia content of the soil, since the optimum dressing for the plant cane crop was at the rate of 2 cwt. per acre.

The plant cane experiments with graded dressings of sulphate of ammonia on *unflooded front land* soil (Exps. A4 and A5) demonstrate the fact that different cane varieties have different nitrogen requirements. The two trials are situated contiguously and experienced practically the same growth conditions. In the one trial, Exp. 4, with the seedling D. 602/22 as indicator, a dressing of sulphate of ammonia at the rate of 3 cwt. per acre appears to be the optimum for plant canes. In the other trial, Exp. 5, with the seedling Diamond 10 as indicator, it is apparent that the optimum dressing lies somewhere above 6 cwt. per acre for the plant cane. There is no evidence that such a heavy dressing as 6 cwt. per acre of sulphate of ammonia impairs the sucrose quality of the plant canes of Diamond 10. The experiments with ratoons on *unflooded front land* soil do not indicate that heavy dressings of sulphate of ammonia, made to the plants and first ratoons, have a residual effect upon the second ratoon crop.

In the one experiment with graded dressings of sulphate of ammonia on *pegassy clay* soil, (Exp. A6) it is apparent that dressings of sulphate of ammonia to the first ratoon canes are responsible for crop increases. No definite differences are to be noted between the effects of the dressings at the rates of 2 cwt., 4 cwt. and 6 cwt. per acre. The general yield of this experiment is low. There is little doubt that climatic conditions adversely affected growth. The plant canes were cut in heavy weather, the young ratoons experienced abnormal rainfall, while during the greater part of the growth period the rainfall was below the average. It is probable that, had conditions approached the normal, interesting results would have been obtained.

Organic Nitrogenous Manures.

Since the reorganisation of the Department certain organic nitrogenous manures have, from time to time, been compared with artificial fertilisers.

Trials with products of the Humber Fish Manure Co. Ltd., (*Agr. Jour., B.G.*, Vol. IV, p. 10) with Kerazotine and Leathermeal (*ibid* Vol. IV, p. 13, Vol. IV, p. 58, *Sugar Bull.* No. 1, pp. 46-52, present *Bull.* Exps. A2 and A3), and with Bacterised Peat (present *Bull.* Exp. A4) indicate that similar yield increases may be more cheaply obtained by the application of artificial fertilisers.

Lime-bearing materials.

Two experiments with lime-bearing materials on *flood-fallowed front land* clay (Exps. B1 and B2.) indicate that *no* definite residual effects are apparent in the first ratoon crop.

One experiment, involving graded dressings of ground limestone on *pegassy clay* soil (Exp. B3), has been reaped as first ratoons. The crop experienced adverse climatic conditions but it is apparent that dressings of ground limestone, given in the row at planting, have a definite residual effect on the yield of cane, the sucrose content of the cane and on the juice purity. All three attributes are beneficially affected. It is obvious that no definite recommendations, based on this experiment, can be made until a number of ratoon crops have been reaped. It should be noted, however, that, in this experiment, a dressing of ground limestone, at the rate of 1 ton per acre applied at planting, is responsible for an increase of 0.51 ton of sucrose per acre in the plant cane and 0.41 ton of sucrose per acre in the first ratoon cane.

One experiment involving graded dressings of ground limestone and agricultural slaked lime on *flood-fallowed* front land clay (Exp. B2) failed to demonstrate any difference between the two sources of lime regarding their residual effects.

Phosphatic manures.

No experiments involving the application of phosphatic manures have been reaped during the period under review. It has been recognised for some time that the question of phosphatic manuring of the Colony's cane soils stands in some need of review. The investigation was hampered by the fact that, until the recently conducted soil surveys were completed, no information was available regarding the distribution of tracts of land deficient in available phosphate. Such information has now been obtained and it is hoped shortly to establish a chain of phosphate trials on the sugar belt.

Harrison (*W.I.B.* XIII, pp. 134-5) favoured the use of superphosphate in view of the alkaline nature of the soils at that time. Trials over three years indicated however, that while superphosphate was responsible for an increase of 4.8 per cent., dressings of slag phosphate gave an increase of 16.1 per cent. The cane soils of the Colony now possess a pronounced acidic reaction. The application of different forms of phosphatic manures under controlled conditions should produce results of interest.

Potassic Manures.

One experiment, involving the application of sulphate of potash to first ratoons grown on *pegassy clay* soil (Exp. D1), has been described. The dressing of potassic manure had a definite and favourable influence on the yield of cane, the sucrose quality of the cane and on the juice purity.

SUMMARY.

The results of seven manurial trials reaped during the first half of the year 1933 are here presented. The experiments generally were subjected to abnormal weather conditions. In the majority of cases the trials experienced heavy rainfall during the early part of their growth and subsequently encountered a period of drought.

As in the case of the first Bulletin, it is impossible, at this stage, to make definite pronouncements regarding the optimum fertiliser practice. The present position is however, tentatively defined. The suggestions must be accepted with some reserve.

Sulphate of Ammonia.

For plant canes on *flooded front land* soil, 2 cwt. per acre appears to be the most suitable dressing. For the first ratoon crop 4 cwt. per acre is perhaps the optimum dressing.

For plant canes on *unflooded front land* soil, 3 cwt. to 6 cwt. per acre appears to be the best dressing, while for the first ratoons a dressing at the rate of $3\frac{1}{2}$ cwt. per acre appears to be more suitable.

For plant canes on *pegassy* soils a dressing of sulphate of ammonia at the rate of 6 cwt. per acre appears to be required. The one experiment reaped as first ratoons indicates that dressings at the rate of 2 cwt. per acre are the optimum, but it should be remembered that this particular trial experienced abnormal weather conditions. Under more suitable circumstances it is likely that heavier dressings would prove profitable.

Some evidence has been obtained in these trials that different varieties of cane possess different nitrogen requirements. This subject requires examination.

Lime-bearing materials.

On *flooded front land* soil small increases in yield, within the limits of experimental error, are obtained in the plant and first ratoon crops with dressings, in the row, at rates up to 6 tons per acre.

On *unflooded front land* soil broadcasted dressings of ground limestone at rates varying between 3 tons and 10 tons per acre give definite yield increases in the plant and first ratoon crops.

On *pegassy* soil, dressings of ground limestone or slaked lime in the row at rates up to 8 tons per acre have a marked effect on the yield of plant cane and a definite residual effect on the first ratoon crop. The dressing at the rate of 1 ton per acre produces in the two crops an increase of 0.92 ton of sucrose per acre.

No evidence has yet been obtained that either ground limestone or slaked lime is to be preferred as a source of lime.

It is apparent that the results of several crops must be obtained before definite statements regarding liming can be made.

APPENDIX I.

Calendar of Agricultural Operations on Manurial Trial Sites.

Experiment No.	Page of Bulletin	Estate	Field	Variety	System of replication	Size of plots, acres	Date of				
							Planting	Applying limestone and/or slaked lime	Applying potash	Applying sulphate of ammonia	Reaping
A I B I	20 37	Port Mourant	6 A.	D. 625	4 randomised blocks of 16 treatments	0.051	5.XII.30	27.XI.30[4]		7.IV.32[5]	1.III.32[4] 27.II.33[5]
A II	24	Sophia Expt. Station	17 E.	B. H. 10 (12)	A five by five Latin square	0.056	13.X.29				25.II.32[5] 27.II.33[6]
A III	26	Blairmont	47 B.L.	D. 625	A seven by seven Latin square	0.051	22.I.30			13.V.32[2, 6] [3, 6] 23.VI.32	8.IV.32[5] 4.IV.33[6]
A IV	29	Sophia Expt. Station	2 E.	D. 602/22	9 randomised blocks of 5 treatments	0.051	11.II.32			11.II.32[1 2] 24.III.32[3]	21.IV.33[4]
A V	32	Sophia Expt. Station	2 E.	Diamond 10	7 randomised blocks of 5 treatments	0.051	15.III.32			6.IV.32[2]	22.IV.33[4]
A VI B III D I	34 40 42	Farm	86 G. D.	D. 625 & D. 118	6 randomised blocks of 20 treatmeuts	0.051	7.II.31	20.I.31[4]	4.V.32[5]	4.V.32[5]	14.IV.32[4] 5.V.33[5]
B II	38	Leonora	21 G. V.	D. 625	12 randomised blocks of 7 treatments	0.043	5.VI.31	2.IV.31[4]			21.V.32[4] 5.V.33[5]

[1] Bacterised Peat [2] First dose Sulphate of Ammonia [3] Second dose Sulphate of Ammonia [4] Plants [5] First Ratoons. [6] Second Ratoons.

APPENDIX II.

Soils of Manurial Trial Sites.

Plantation:—	Pln. Port Mourant		Sophia Experiment Station		Pln. Blairmont		Pln. Farm		Pln. Leonora	
Field No.:—	A. 6		2 East		B.L. 47		G.D. 86		G.V. 21	
Sample No.:—	BCP. III.	BCP. IV.	D. 654	D. 655	BCP. I.	BCP. II.	D. 304	D. 305	D. 509	D. 510
Normal pH	6.1	6.8	5.62	5.30	4.2	4.3	4.2	4.0	5.1	5.2
Exchange pH	4.9	5.7	4.94	4.70	3.6	3.9	3.9	3.6	3.8	3.9
M.P.S.	51.9	51.3	43.9	48.8	43.7	40.9	61.8	68.2	41.9	46.6
% Sand	2.5	1.5	4.0	3.7	9.9	15.3	4.0	1.0	2.8	2.9
Index of texture	51	51	43	48	42	38	61	68	41	46
% Soluble salts	0.065	0.159	0.217	0.425	0.031	0.022	0.038	0.033	0.013	0.028
% Organic matter	2.19	...	1.81	0.90	1.20	...	7.70	...	1.36	...
% Nitrogen	0.179	...	0.125	0.094	0.100	...	0.329	...	0.130	...
Carbon/nitrogen ratio	7.10	...	8.41	5.54	6.98	...	13.6	...	6.05	...
Rate of solution	127	54	...	...	9	0	0	5	20	10
Lime reqt. ton/acre $CaCO_3$	3.2	1.1	1.9	2.6	13.1	...	21.1	19.3	9.3	...
Avail. P_2O_5 p.p.m. (Truog)	24	30	18	15	25	28	124	30	36	32
Citric P_2O_5 %	0.0043	0.0059	0.0040	0.0031	0.0013	0.0022	0.0586	0.0057	0.0175	0.0063
Citric K_2O %	0.0097	0.0087	0.0102	0.0097	0.0048	0.0048	0.0034	0.0053	0.0058	0.0053
Exch. and water sol. bases mg. eqs./100 gms.										
Lime	6.74	4.93	9.90	5.78	3.00	3.85	2.61	1.70	5.38	4.59
Magnesia	15.57	14.30	9.14	8.60	1.81	1.45	1.27	0.91	7.42	10.14
Potash	0.29	0.33	0.37	0.25	0.12	0.21	0.17	0.12	0.25	0.39
Soda	1.80	4.90	2.73	4.76	0.26	0.18	0.03	0.04	0.33	0.86
Alumina	...	...	...	...	...	...	41.18	13.53	6.47	2.94
Ferric Oxide	...	...	...	...	...	...	...	...	7.41	3.33
Magnesia/Lime ratio	2.31	2.90	0.92	1.49	0.60	0.38	0.45	0.54	1.38	2.21